ELECTRICAL WORLD

for the Week Ending

October 11, 1930

We must not be lulled into a feeling of security. Tomorrow or the day after the electric lamp may pass as did the whale-oil lamp, the kerosene lamp, the tallow candle and the gas jet.

W. A. JONES,
President N.E.L.A.

Arizona sues to halt Hoover Dam work

Westinghouse memorial dedicated

St. Lawrence power market to be probed

More "write-ups" charged at hearings

—ARIZONA, after prolonged period of threatened action, finally files suit in United States Supreme Court to halt Hoover Dam on constitutional grounds.

—ROCHESTER, N. Y., asks its utility company for lower rates. Not long ago accused by Governor Roosevelt of unwillingness to co-operate, company agrees to talk things over.

—CONTRACTORS' CODE proposed by Association of Electragists International to raise standards of the trade. More "thou shalt's" and "shalt not's" enumerated. The code will be subject to Federal Trade Commission approval.

—ELECTRIC WELDING accepted as boiler-fabricating medium. Babcock & Wilcox Company develops procedures insuring known strength of welds.

—CAPITAL WRITE-UPS galore charged at Federal Trade investigation of Bond & Share properties. Hearing adjourned as Minnesota company defers complete rejoinder.

—ST. LAWRENCE power board appoints two counselors to advise on market for energy from projected New York State hydro development.

—NEW HAMPSHIRE probe of Associated properties promises to be thorough. Limited by court decision to operating companies, commission submits comprehensive "interrogatories" for prompt reply.

NEWS OF THE WEEK

Illuminating Engineering Society Gets New Street-Lighting Code

A CODE on street lighting presented at the Richmond (Va.) convention of the Illuminating Engineering Society this week and embracing the consensus of opinion of 22 committee members, of whom Preston S. Millar was chairman, aroused applause and was declared no small achievement in view of the controversial nature of the subject.

About 50 papers and addresses were packed into the five days' sessions of the society. Central-station lighting service engineers held a pre-convention meeting on Monday at which such topics as conducting lighting service departments, the extent and personnel of such departments and the demonstration of the value of lighting in the home were discussed. A new method of comparing asymmetric reflectors was described, and the desirability of indexing the National Electrical Code for illuminating engineers and of periodically distributing pamphlets containing lighting data was brought out. Interest was especially keen in eliciting plans for establishing contact with architects and dealing with chain stores. Some co-ordinated method of approach developed on a national basis was sought, in view of the widespread nature of the problems.

At the convention proper an entire session was given to the relationship of architects with illuminating and consulting engineers. At this session the lighting of Severance Hall, the home of the Cleveland Symphony Orchestra, and of a replica of the Parthenon were described. Other major convention topics were indoor and outdoor lighting practice, various phases of ultra-violet radiation, educational courses, automatic control of light, the reflection factors of acoustical materials and the factors that influence seeing.

Ultra-violet radiation was considered of such importance that eight papers were devoted to it, and an inspection trip afforded delegates an opportunity to see its practical application in the treatment of tobacco by the American Tobacco Company.

To establish a better appreciation of the architectural problems of illumination a plan was discussed which is still in the formative stage for awarding a yearly prize of $50,000 to the person contributing the best solution of some architectural lighting problem to be submitted by the American Beaux Arts Institute. The terms under which the competition shall be conducted and the method of financing the award have not yet been worked out in detail.

W. F. Little of the Electrical Testing Laboratories, New York, was inducted as president.

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Illumination Congress for London Next Year

AN INTERNATIONAL ILLUMINATION CONGRESS is planned for next year by two British organizations—the National Illumination Committee and the Illuminating Engineering Society (of Great Britain)—with co-operation from a score of other bodies, including the

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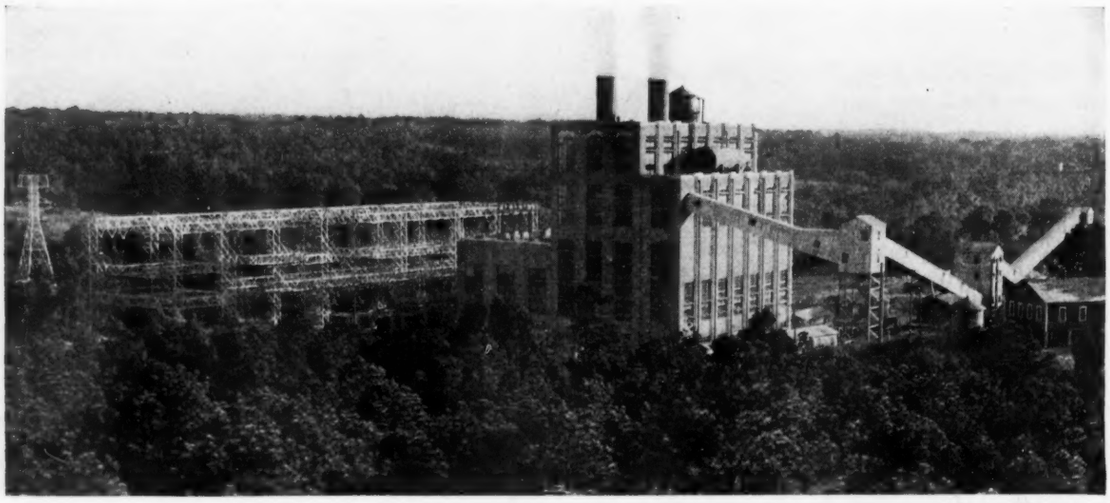
SOUTHEAST'S NEWEST BIG STEAM GENERATING PLANT



Plant Atkinson, the new 75,000-kw. (initial) steam-electric generating station of the Georgia Power Company, built on the Chattahoochee River near Atlanta, is all ready for the formal opening on October 17.

Institution of Electrical Engineers and the Electric Lamp Manufacturers' Association.

Dates set for the congress are September 3 to September 19, and the program includes sessions in or visits to London, the headquarters; Glasgow, Edinburgh, Sheffield, Birmingham and Cambridge. Virtually every kind of lighting will be covered in reports and papers from many countries. Colonel C. H. S. Evans is honorary general secretary, with offices at 32 Victoria Street, London, S. W.

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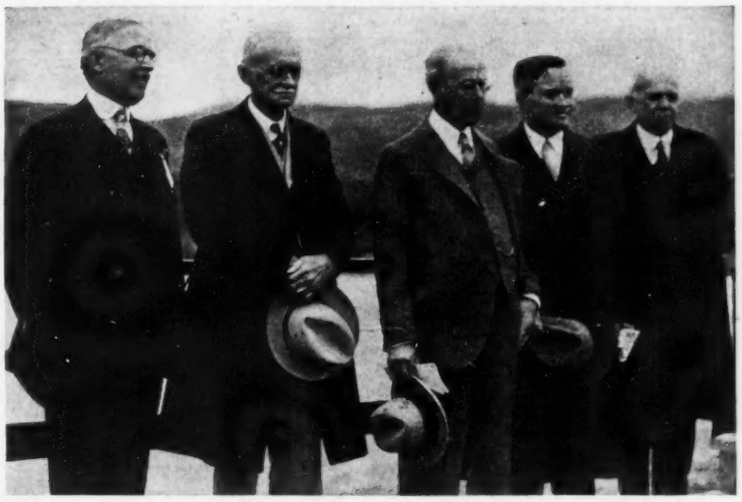
Power Board Issues Cause Much Agitation

CHARGES that the recent opinion of the Attorney-General limiting the authority of the Federal Power Commission on non-navigable streams was prompted by a desire to free power companies from the restrictive features of the water-power act have caused the commission to make public the protests which form the basis of the reference of the matter to the Department of Justice. These show that Governor Conley of West Virginia declared that the effect of the action of the commission in taking jurisdiction is to delay water-power development, that Governor Horton of Tennessee objected vigorously to the assumption of jurisdiction by the commission, and that William E. Carson, the chairman of the Virginia Commission of Conservation and Development, urged it to "face squarely this troublesome and important question in the light of the fundamental law of the land." No power company has yet applied for an amendment of its license because of the decision.

In questioning pre-license costs of the Lexington Water Power Company in connection with the Saluda Dam near Columbia, S. C., C. A. Russell, solicitor in the offices of the Federal Power Commission, took an "absurd" position in the opinion of William M. Bullitt, former Solicitor General of the United States. In a brief filed on behalf of the licensees he says that such an attitude would stop all water-power development.

Hearings will be held by the Federal Power Commission next month as the result of protests from two hydroelectric companies over the slashing by commission accountants of the companies' statements of pre-license costs. The companies involved are the Clarion River Power Company of Johnstown, Pa., licensee of the Piney project on the Clarion River, Pa., and the Wisconsin Power & Light Company of Madison, Wis., licensee of the Shawano Dam development on the Wolf River, Wis. The former will be heard November 5 and the latter November 12.

WHEN FIFTEEN-MILE FALLS WENT ON LINE



Distinguished guests who watched the inauguration of service from the big new Connecticut River plant on Tuesday of last week included (left to right) Chairman Attwill of the Massachusetts Department of Public Utilities, Governor Weeks of Vermont and Governor Tobey of New Hampshire. President Comerford and Vice-President Moore of the New England Power Association complete the group.

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Bids for Power to Build Boulder Dam Opened

THREE BIDS FOR ELECTRICITY for use in building Boulder Dam were opened last week at Denver. They came from the Southern Nevada Power Company of LasVegas, the Inland Utilities Company of Kansas City and the Southern Sierras Power Company of Riverside, Cal. No figures were given out, the papers being sent to Washington to the Commissioner of Reclamation.

The LasVegas company would merely extend its transmission lines, the Kansas City company would erect a power site on the premises and operate with Diesel engines, and the Riverside company would extend its transmission lines 235 miles from San Bernardino.

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Arizona Files Her Suit in U. S. Supreme Court

ARIZONA'S LONG-THREATENED SUIT to challenge the legality of the Boulder Dam act was filed in the United States Supreme Court last Monday by Attorney General K. Berry Peterson of that state. The bill, which makes the six states that signed the Colorado River compact defendants, as well as the Secretary of the Interior, asserts that the act was in excess of the powers of Congress for five reasons, one of them being that it attempts to discriminate against the State of Arizona in favor of the State of California by providing that the water to be stored in the reservoir shall be delivered without charge for use in the Imperial and Coachella valleys of California, whereas water users in Arizona must pay prices set by the Secretary of the Interior.

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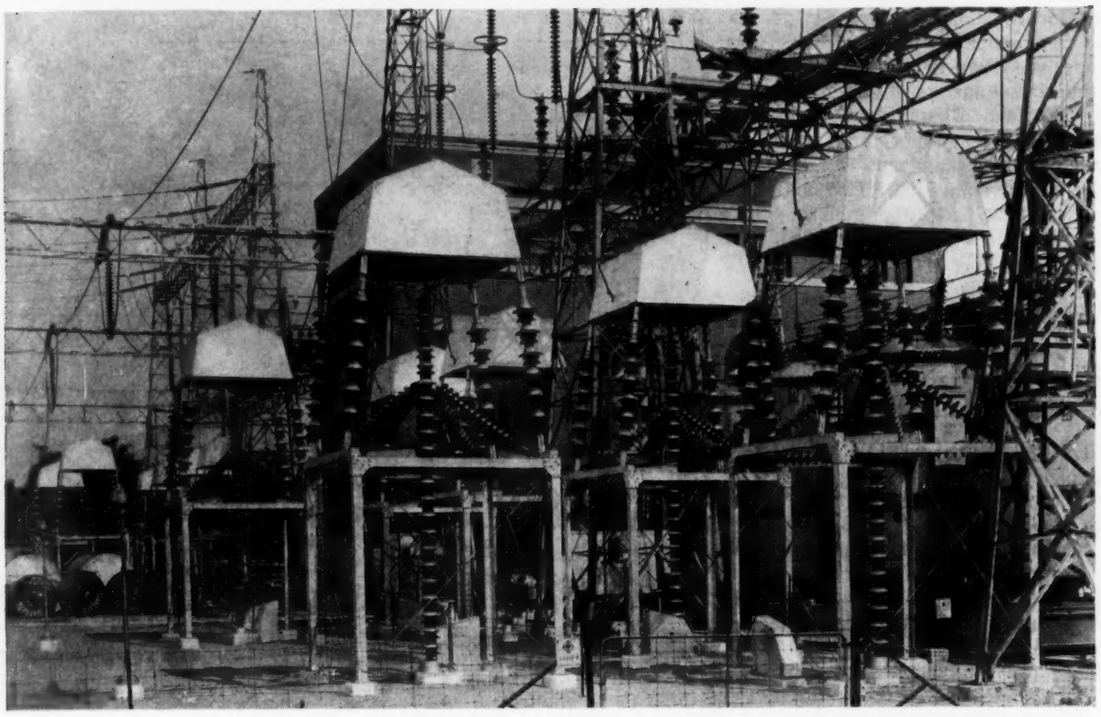
First Output from Tube in Gulf Stream Is Small

GEORGES CLAUDE HAS ANNOUNCED the production first of 10 kw. and then of 20 kw. in the experimental plant at Matanzas, Cuba, which he is operating through his submerged power tube, taking advantage of the difference in temperature between surface and deep water off the Cuban coast. On Monday last he caused 40 500-cp. lamps to glow for half an hour. Professor Claude sent a message to Paris saying:

"The outcome of the first trial is satisfactory in view of the slight difference in the temperatures. I am convinced that our ten modest kilowatts, obtained under mediocre conditions, gives new assurance that human industry will never lack mechanical energy to animate it."

Dr. Luciano de Goicoechea, professor of electrical engineering at the University of Havana, however, throws doubt on the possibility of producing in this way cheap commercial power in large quantities, which is the end sought.

LIGHTNING ARRESTERS IN CANADA HAVE 268-KV. CAPACITY



At the Leaside station of the Hydro-Electric Power Commission, Toronto, what are declared to be the largest arresters in the 220-kv. class and also the highest-voltage arresters ever built have been installed by Westinghouse. Their normal rating from line to ground of 218 kv. is increased to 268 kv. by means of a relay-operated switch in the event of system overvoltage caused by runaway.

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N.E.L.A. Engineers Meet in Montreal

A VERY LARGE ATTENDANCE was had at the meeting of the Engineering National Section of the National Electric Light Association at Montreal on October 5 to 8. Each national committee held a two-day session at which representatives from all parts of the country discussed the engineering problems of the industry. The Canadian Electrical Association was host to the visitors and arranged many inspection trips to Canadian water-power plants and to the lines and substations of the local utilities.

Reduction in costs through standardization and simplification was the center of interest in the discussions of most of the committees. There is evidence that greater standardization in many items of utility equipment will reduce costs and make operations less complicated. An encouraging feature of the equipment situation is that no major troubles are now reported for any apparatus. New departures in practice were discussed, and outdoor construction, nitrogen-cooled equipment, use of welding, the field of oil-filled cables, communication on systems, relaying and high-tension metering were typical topics.

Codes, standards, specifications and accident prevention were also gone into. Abundant evidence showed that engineers are busy with a multitude of tasks, and while no outstanding development in the art was reported, it was made clear that much remains to be done in system planning and equipment standardization and that both investment and operating costs will ultimately be reduced.

About 450 engineers attended the meeting, and an enjoyable feature was the presence of many from Canadian utilities.

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Sayreville (N. J.) Plant Goes Into Service

AN IMPORTANT ADDITION to generating-plant capacity on the Atlantic Coast has just been placed in operation as part of the Utilities Power & Light System, its subsidiary, the Eastern New Jersey Power Company, having started up two 30,000-kw. units of what eventually will be a 180,000-kw. station on the Raritan River at Sayreville, N. J. The new plant is tied in with two properties serving adjacent territory, thereby providing for an interchange of power and insurance against loss of service. It is most modern both in design and equipment and its location on tidewater permits delivery of coal by water. A residential subdivision has been laid out near by upon which modern homes exclusively for employees have been erected.

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Waukegan Installs New 65,000-Kw. Generator

TURBO-GENERATOR UNIT No. 4 has just been put into service at the Waukegan station of the Public Service Company of Northern Illinois, the largest power house of that company. It is an Allis-Chalmers machine, rated at 65,000 kw. and bringing the total station capacity to 175,000 kw. Three boilers installed with it will burn pulverized coal, two of them being standard type and the third having a dual purpose—to reheat steam from the turbine and to generate live steam in a separate section.

The initial steam pressure of the new unit is 600 lb. and the temperature 725 deg. F. A new transformer bank of three 20,000-kva. units raises the voltage to 132 kv., at which tension the greater part of the energy will be transmitted considerable distances over the company's steel-tower lines.

Mokelumne Plant to Be Ready Next Summer

LATE COMPANY REPORTS concerning progress on the forty-million-dollar hydro-electric development being made by the Pacific Gas & Electric Company on the Mokelumne River are to the effect that it will be in operation in mid-summer of 1931—on schedule. Construction of various units is proceeding rapidly. Salt Springs Dam, keystone of the project and said to be the largest rock-filled structure in the world, is three-quarters of the way up to its final height of 330 ft.

Meanwhile construction crews are busy on two of the four power plants that will generate 228,000 hp. Salt Springs power house, at the base of the dam, is one of them. It will have a capacity of 48,000 hp. The other plant under way is at Tiger Creek, 18 miles below. It will develop 80,000 hp. Besides these, there will be a 20,000-hp. plant at West Point, and the present Electra plant will be enlarged to 80,000 hp.

The Tiger Creek conduit, which will carry 550 sec.-ft. of water from Salt Springs to the Tiger Creek plant, is well on the way to completion. Construction of 127 miles of transmission lines, to bring the power down to the Bay region, is also being speeded.

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No Let-up in Texas' Electrical Development

WHAT MAY BE REGARDED as in some sense an index to continuing prosperity in south and southwest Texas, despite the widespread slump, was the new high record in electric power generated in a single month which was made during August by the Central Power & Light Company, an Insull subsidiary, according to E. B. Neiswanger, president of the company.

Generating on an average more than a million kilowatt-hours a day for the entire month, the company's power plants, serving 165 communities in south and southwest Texas, generated a total of 31,054,069 kw.-hr. during that month, an increase of 26.5 per cent over the output of August, 1929. Compared with the first seven months of 1929, the company's output for the same period in 1930 shows an increase of 33 per cent.

The Texas Utilities Company, subsidiary of the Community Power & Light Company of St. Louis, is constructing a power plant near Abernathy, 20 miles north of Lubbock, which will have an ultimate capacity of 45,000 kw. The new plant will serve a large area of the South Plains of northwest Texas. It will be completed about January 1. The company operates over a 690-mile transmission system in the Panhandle and South Plains territory with existing plants at Lubbock, Amarillo and Plainview, Tex., and Clovis, N. M.

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Hydro-Electric Progress in the French Republic

A HYDRO-ELECTRIC POWER STATION with a capacity of 36,000 kva. has recently been completed in the Beneyte Valley, France, by the Société Hydro-Electrique de la Diége. The work has included the construction of a dam 114 ft. high and ranging in width from 85 ft. at the base to more than 320 ft. at the top to form a lake nearly 4 miles in length to store over 1,500,000,000 gal. of water. The generating plant, which works under a head of 430 ft., comprises four Escher-Wyss Francis-type 9,000-hp. turbines, coupled to 5,000-volt alternators running at 500 r.p.m.

A feature of the generators is that they are each fitted with four piston-type brakes operated by compressed air sufficiently powerful to bring the machines to rest in less than five minutes. The brakes can be put in operation either close to the machines or from the switchboards. The power generated is stepped up for transmission purposes to 70,000 volts by four 9,000-kva. oil-cooled transformers, there being also three 1,500-kva., 5,000/20,000-volt transformers.

In a recent budget speech in the French Parliament it was stated that hydro-electric plants with a combined capacity of 321,390 hp. are at present in course of construction in France and that projects totaling 960,300 hp. are under consideration. Even when all these plants are completed, there will still be more than 3,000,000 hp. in water power available, the statement showed.

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Project on New River Would Cost $23,000,000

A PICTURE OF BENEFITS that would accrue from the proposed water-power development at Hinton Falls and Bulls Falls on the New River was presented to the West Virginia Public Service Commission on September 30 by the West Virginia Power Company when the hearing on the company's application for a license opened. Claims that industries would follow the development, that local taxes would be reduced, that population would increase and that the valley of the Kanawha would be especially benefited were made by N. M. Argabrite, vice-president of the company, which is a subsidiary of the Appalachian Electric Power Company of Roanoke, Va.

Power developed would be sold exclusively in West Virginia, serving 21 southern counties. Railroad and other projects have been withdrawn, and Virginia has consented to the construction

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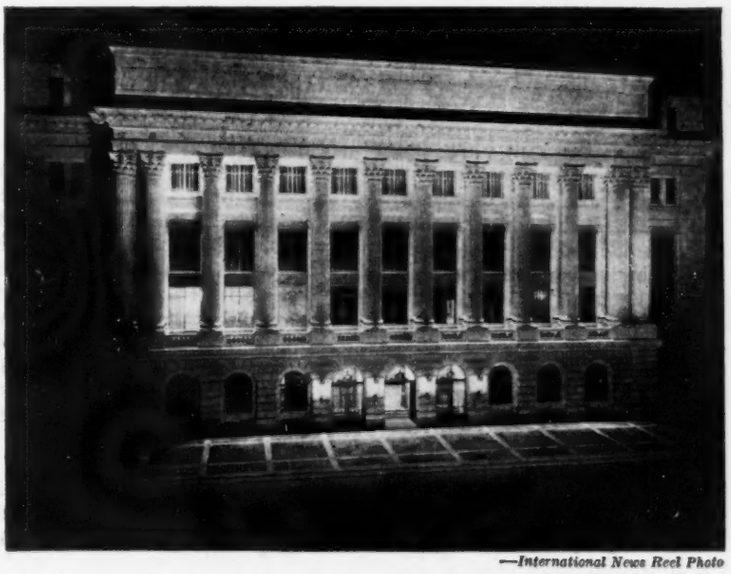
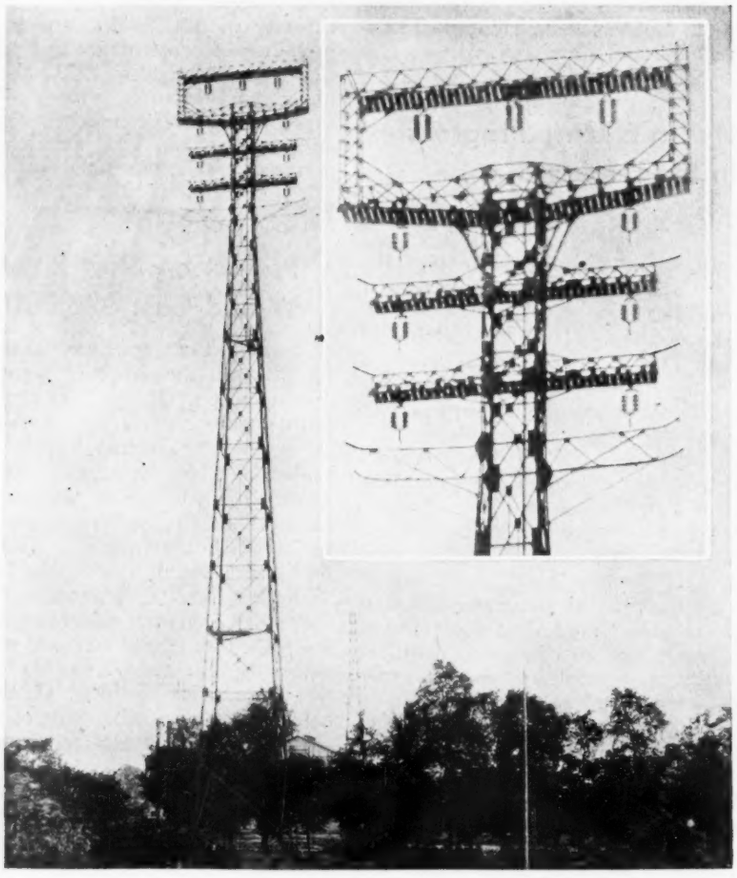
FLOODLIGHTING CORINTHIAN COLUMNS



—International News Reel Photo

Washington official architecture lends itself well to white floodlighting. Above is a night picture of the new unit of the Department of Agriculture's Administration Building.

HOW WIRES SPAN A FRENCH SHIP CANAL



A substation at Saint-Lo, department of La Manche, France, is supplied by a 60-kv., 40-mile transmission line recently extended from Caen. This line crosses the ship canal from Caen to the sea on 203-ft. steel towers, shown above, with end supporting towers respectively 59 ft. and 82 ft. in height. The main span, across the canal, is 682 ft. Notice the boxed-in circuit at the top of the towers and the curved guards under the wires to catch them should insulators break.

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of that part of the Bull Falls development which would extend into Giles County, Va. Total cost of the project is put at $23,000,000 and total installed capacity at 190,000 hp. The company in 1924 submitted an application for a single development, but on July 31 last filed an amended application calling for two dams.

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New Hampshire Utility Investigation Thorough

NO INTENTION TO EXPEDITE its proceedings in the inquiry into the management of the New Hampshire Gas & Electric Company and the Derry Electric Company, subsidiaries of the New England Gas & Electric Association, has been manifested by the New Hampshire Public Service Commission, which, after a number of hearings, has taken a recess until October 27 to permit the companies to answer written interrogatories. The commission, which, as before reported, was enjoined by a United States court from examining the holding company and limited to companies operating within the state, has brought out many details of administration as carried on by or for the local companies under outside control, and officers of the New England Gas & Electric Association are among the witnesses.

Utility counsel asserts that there will be no admission that the management, purchasing, engineering, construction and financing services brought to the New Hampshire companies through contracts with such corporations as the J. G. White Management Corporation, the W. S. Barstow Engineering Company and the Consumers' Construction Company were subject to supervision of the New Hampshire commission or that these organizations were "foreign corporations" doing business in New Hampshire.

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U. S. Court Finds 7.25 per Cent Return Confiscatory

FINDING AN ALLOWED RETURN of 7¼ per cent to a public utility company confiscatory, the United States Circuit Court of Appeals at Philadelphia has recently confirmed a district court in New Jersey in upholding the Elizabeth Water Company in its action against the Board of Public Utility Commissioners of New Jersey, which had fixed the company's rate of return at the figure stated. A chart showing water rates charged in 33 cities in different parts of the country, some of whose plants were owned and operated by the municipalities, offered in evidence by the board as a basis of comparison with the rates imposed by the board, was properly excluded, the reviewing court said, in the absence of a showing that the other cities were comparable with the municipalities concerned or that the operating costs were similar.

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Utilities Complain of Increased Assessments

MATERIAL INCREASES IN TAX ASSESSMENTS of power companies are reported in Alabama and Mississippi. The increase applies to 1930 taxes, due October 1 this year. Thomas W. Martin, president of the Alabama Power Company, declares that constantly increasing taxes are one of the biggest problems facing electric power companies in the South. Relief is to be sought from the 1931 Legislature.

In Alabama fewer than ten of the state's 67 counties failed to raise their tax assessments against the Alabama Power Company. In Jefferson County, containing Birmingham, the assesssment was raised from $2,016,044 in 1929 to $4,253,100 in 1930. Walker County, location of Gorgas steam plant, raised its assessment from $5,301,053 in 1929 to $6,894,111. In Elmore County, where extensive hydro-electric projects are located, the assessment was raised more than $1,000,000.

The Mississippi Tax Commission has put its assessment of the Mississippi Power & Light Company for 1930 at $10,374,393, a rise of $4,824,520.

Similar complaints are made by public utility companies in the Middle West and virtually all parts of the country.

In Massachusetts, for instance, Sheldon E. Wardell, counsel for Massachusetts public utility interests, speaking recently before a meeting of New England state tax officials, declared that Massachusetts assessed heavier taxes on electric and gas utilities than any other state except Oregon. Mr. Wardell said: "If the growth of the public utility industry is to continue, it will require constantly increasing investment to meet the demands of the home, the farm and our industries, and it is clear New England will be handicapped both in cost of energy and in securing additional capital for development if this tendency to increase taxes keeps up."

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Severance Damages Are Issue at Puyallup, Wash.

SUIT OF THE CITY of Puyallup, Wash., to condemn the local light and power distribution system of the Puget Sound Power & Light Company is under way in a United States court at Tacoma. Severance damages will play a large part. The company is expected to put these at a high figure. R. E. Towne, engineer for the city, made no allowance in his figures for the company's loss of business, declaring that the city is proposing to buy power wholesale from the company and distribute it. He figured severance damages at only $14,952. The city declares that it wants to buy only a joint-user privilege on the company's high-tension transmission line for the feeder and distribution wires carried on it.

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Coming Meetings

American Institute of Electrical Engineers — Middle Eastern District, Philadelphia, Oct. 13-15; Southern District, Louisville, Nov. 19-22. F. L. Hutchinson, 33 West 39th St., New York.

American Society of Agricultural Engineers — North Atlantic Section, Seneca Hotel, Rochester, N. Y., Oct. 16-18. Secretary, St. Joseph, Mich.

American Engineering Council — Administrative Board, Mayflower Hotel, Washington, Oct. 17 and 18. L. W. Wallace, 26 Jackson Place, Washington.

Rocky Mountain Division, N.E.L.A.— Franciscan Hotel, Albuquerque, N. M., Oct. 20-22. O. H. Weller, Public Service Co. of Colorado, Denver.

National Electrical Manufacturers' Association — Chamberlain-Vanderbilt Hotel, Old Point Comfort, Va., Oct. 20-24. A. W. Berresford, 420 Lexington Ave., New York.

National Electrical Wholesalers' Association — Pittsburgh, Nov. 10-14. E. Donald Tolles, 165 Broadway, New York.

National Association of Railroad and Utilities Commissioners—Charleston, S. C., Nov. 12-15. J. B. Walker, 270 Madison Ave., New York.

New York Commission Appoints "Examiners"

BY THE APPOINTMENT of two "examiners" to hold hearings in outlying and rural sections of New York State, where it is often difficult for any member of the commission to find time to go, the New York Public Service Commission has made an innovation which it thinks will both expedite proceedings and consult the convenience of complainants and residents in such districts, who will be relieved of any necessity for traveling from their homes to cities to give evidence.

The new appointees are John F. O'Brien of Wolcott, Wayne County, a lawyer specializing in public utility matters, and William T. Wilkinson, a former examiner for the Interstate Commerce Commission, who is both a lawyer and an engineer.

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St. Lawrence Commission Names Advisers on Market

APPOINTMENT OF TWO ADVISERS on technical problems of marketing and distributing power that may be developed on the St. Lawrence River has been announced by Robert N. Haig, chairman of the St. Lawrence Power Development Commission. These appointees are Colonel John P. Hogan and Dr. John Bauer, and they will begin at once a study of the potential market for St. Lawrence power. The commission also elected S. Burton Heath as its secretary.

Colonel Hogan is a member of the firm of Parsons, Klapp, Brinckerhoff & Douglas, consulting engineers, New York. He spent eleven years as an engineer on the construction of the Catskill aqueduct. Dr. Bauer is widely known as a public utility rate expert and statistician who often represents organizations leaning toward public ownership.

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Engineering Board Busy Studying St. Lawrence

POSSIBILITIES FOR POWER DEVELOPMENT along the St. Lawrence River between Cornwall and Prescott, Ontario, were studied on October 2 by the engineers' advisory board of the St. Lawrence Power Development Commission of New York State, consisting of General Edgar Jadwin of Washington, chairman; Oscar G. Thurlow, Silas H. Woodard and Col. F. S. Greene, State Superintendent of Public Works. The engineers toured the Canadian shore of the river for 50 miles west of Cornwall, special attention being paid to the Long Sault Rapids.

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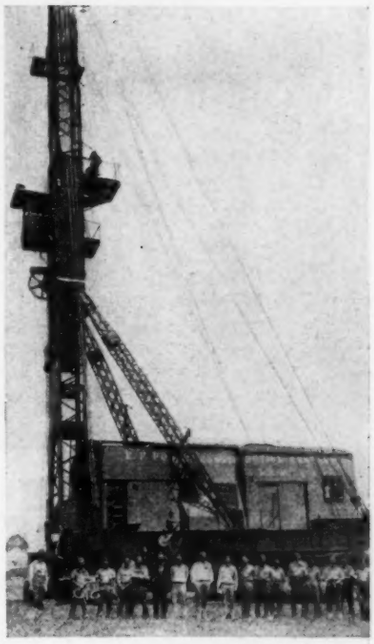
ELECTRICITY HELPS BUILD LEVEES



This tower excavating machine, used for levee construction near Gunnison, Miss., is energized from a Mississippi Power & Light Company high-tension line. It excavates 25 per cent more volume than towers using other forms of power.

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Rochester, N. Y., Asks Lower Domestic Rates

RATES AT ROCHESTER, N. Y., which have been under attack and were noticed obliquely by Governor Roosevelt in a recent political speech made at that city (ELECTRICAL WORLD, September 6, page 418), will be the subject of a conference, called at the instance of Public Service Commissioner M. C. Burritt, between city and county officials and representatives of the Rochester Gas & Electric Corporation. The conference will be held in about two weeks, with representatives of the power company, the Associated Gas & Electric Company—the controlling organization —and the commission present.

The aim will be to reduce rates to the domestic consumer and bring charges down nearer to the average domestic bill in Buffalo, where $2.30 is said to compare with $3.50 in Rochester.

GEORGE WESTINGHOUSE MEMORIAL, SCHENLEY PARK, PITTSBURGH

—benefactor of humanity through his labors and inventions
—the gift and tribute of 54,251 fellow workers

EDITORIALS

L.W.W.MORROW
Editor

Uniform and simple rates

THE public does not understand present differences in rate forms and rate structures. Consumers cannot grasp the reasons for non-uniformity in rates, for the use of class rates and for the adoption of inducement rates. Nor is the situation understood much better by many within the industry. Even rate students who understand the history and reasoning back of present rates can see little daylight in the direction of making the simpler and more uniform rates the public seems to desire.

Compromises in adjusting cost of service, value of service and character of service to a practical rate and the tying of this rate to a kilowatt-hour unit of measurement have been the background upon which present rate systems have been developed. Now, the kilowatt-hour represents a cost element of from 10 to 30 per cent of total cost, the capital and operating costs from 70 to 90 per cent, and the energy unit does not differentiate between classes of service. The kilowatt-hour is the major millstone on the neck of the rate structure. Its use as the unit is about as valid in logic as would be basing telephone rates on the metered energy used by a telephone.

Analysis of investment costs by classes of service helps little in fixing rates. It is not the road to simplification of charges. Power rates have been fixed largely by competitive conditions, commercial rates have been affected by value of service, and residence rates have a background in precedent and policy. If rates were to be based on the investment and operating costs of each class of business, they would perhaps be raised in some classes, especially residental, and lowered in others, and the method would result in complicated rate structures. Cost analyses mix capital costs, operating costs, demand and energy in such a way as to put multiple cost elements into any equitable or logical rate structure.

Practical rates should include a demand or capital charge and an energy or operating charge, and these charges cannot be equitable and still be uniform for different classes of business. Elements of policy and value of service must reside in a rate structure despite all theoretical reasoning. Rate structures must include recognition of a capital and operating cost as well as an energy cost and should have an inducement element—thus building a three-part rate. The greater the degree of equity in electrical rates, the greater the degree of complexity in any practical rate structure. At the present time educational work should be done to get the public to understand the reason for a capital charge, and the industry should strive to get more uniformity in type of rate structure.

Westinghouse

MODERN civilizations like ancient ones have their heroes and their leaders. Pericles and Augustus Cæsar did not more fittingly symbolize their respective eras than the great inventors, the great organizers, the great producers symbolize ours. In the front rank of these present-day demiurges—these shapers of their time—stood and still stands George Westinghouse. From the month when at sixteen he shouldered a rifle in defense of the Union until his death on the eve of a still greater war, he fought with genius, versatility, courage, determination, fairness and humanity, as inventor, engineer, promoter and manufacturer, to advance progress as our era sees it, pioneering in half a dozen spheres and doing the work of a dozen men of parts. He impressed

upon the Westinghouse undertakings a shape and imbued them with a spirit that still endure. When he died the enterprises he formed were employing two hundred thousand persons.

Single-handed, George Westinghouse put the airbrake on the railroads of the world. In cooperation with brilliant technicians he made the generation and transmission of alternating current a reality, opening a new chapter in the book of electricity still greater in direct results than the ones that had gone before. Those who view the beautiful monument just dedicated to him in his adopted city can by looking around them view one still more imposing. Did his spirit stalk the earth in a mood of self-complacence foreign to the man himself, it might inscribe in luminous characters over the door of every important power house the boast of Æneas, but in a happier sense: "A great part of this I was."

Brakes on rural service or full speed ahead?

LESSONS, learned in the traditional school of experience, have led utility men to look somewhat carefully upon further opportunities for rendering service to rural areas which are held to promise both profit to the company and satisfaction to the user. The facts are known about rural service. Further extensions of lines into virgin territory must meet the cold-blooded inquiry, sooner or later, of "When will it pay?" What counts in the end is "kilowatt-hours per mile," whether it be on one farm or many. Building the line must be tied into selling the farmer.

The farmer is a seeker for electric service and, once connected to the line, has an insatiable, if slow-growing, appetite for applications of electrical energy which will free his hands from any part of the manual labor now entailed upon him. The problem of rural service extensions is almost entirely one of selling the farmer full service at the start. In a sense it is the same problem that arises with the small consumer in more thickly settled districts, and ultimately it becomes not so much an engineering difficulty as a merchandising problem. Far more important than promotional rates as such is the group merchandising idea. Complete electric service through provision of the necessary energy-consuming equipment by the utility in the most painless and inexpensive manner possible is the almost inescapable conclusion.

Full speed ahead for rural line extensions is in most instances neither madness nor folly if customers can at the start be made purchasers of 350 kw.-hr. or more per month. Many farms have developed to such magnitude as users through the cumulative development of load over appreciable intervals. In the selling at the start of full electric service lies an opportunity and an obligation.

The utilities and technological unemployment

OPPORTUNITY for a rather unusual type of service which might well qualify as a public service function presents itself in connection with what is known as technological unemployment. This periodic displacement of workers by the introduction of labor-saving devices calls urgently for some solution or alleviation.

Utilities are well qualified to take the initiative and help in the adjustment of this problem, which is an inherent feature of our mechanized culture. Labor itself is immobile. The displaced worker frequently remains unemployed because he lacks the knowledge, adaptability and facilities required to obtain some other type of employment. Nor is the industry which has dispensed with the services of certain of its employees usually equipped to place them elsewhere.

But the utility is a public servant both to the various industries and to the workers concerned. It obviously possesses data with regard to what other industries or types of business may constitute a possible outlet for the displaced workmen, be they white-collared or in overalls. It also is concerned in maintaining all its industrial consumers on an even economic keel. In large measure the utility is placed in a position of leadership in any community development movement.

It may be argued that the function of the utility is to provide electric light, gas or water service. This is true. But the conception of where service begins and ends has changed with conditions. Possibly helping to keep consumers in a position to pay for service is a part of the function of the

public relations department. It would seem quite probable that such a service would ultimately pay dividends in the maintenance of uniform load. It would also contribute to good public relations and to the smoothing of the business curve—to the harnessing of this economic Frankenstein monster which the human race has erected but cannot always control.

A chance for experiment

RESTRICTED real estate development in tracts which aim at exclusiveness and architectural attractiveness creates a unique problem for the electric company. This is especially true when the community or the promoters retain control of the streets apart from the public highway system of the municipality. Who shall dictate the details of distribution, construction and location? Who shall install the system and bear the initial expense? Who shall be responsible for its maintenance and performance? To what extent are the considerations similar to those surrounding a temporarily unprofitable extension into territory under full municipal jurisdiction? What contractual arrangements are necessary?

There is much to commend the solution in which these questions are answered somewhat as follows: First, the promoter submits his layout and esthetic desires to the utility company. The company lays out the distribution system with detailed specifications for materials and installation. The promoter installs it at his expense under the supervision of company inspection. The company takes title at a normal or compensatory price and consequently assumes the maintenance and the responsibility for reliable performance. In fact, there has been notable success under this procedure in some localities.

The common form of construction is parkway installation of all circuits: Primaries and street-lighting cables are steel-armored, lead-covered, placed six inches apart in a two-foot trench near the curb; the secondary (and telephone) cables are in the same trench along its sidewalk edge. The secondary cables are at present generally steel-armored, but non-metallic sheath is likely to have a full chance to prove its economic and practical superiority. In many respects the type of real estate development in question offers an appropriate opportunity to experiment with capital-conserving methods of distribution and ascertain their long-range practicability.

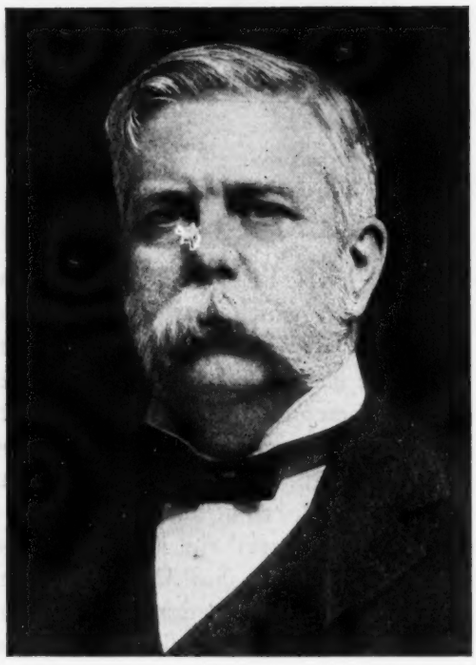
Position of generator terminals handicaps station designers

TERMINALS of large turbo-generators have been giving station designers considerable trouble because they are generally brought out at the bottom of the generator within the air duct. That position is generally very crowded when horizontal steel members are used in the foundation, and more particularly when "H" members with their wide flanges are employed, as has been the custom of late for sound structural reasons. This condition makes it difficult to bring the leads out from the generator through the air-duct walls on the way to the switch. As a rule it is necessary to provide current transformers within the delta or star connections of the generator for differential protection. Sometimes two sets of such current transformers are required, and then the station designer finds himself faced with crowding all these current transformers within the air duct or bringing six leads instead of three out through the air-duct wall.

Would it not be better to bring the leads out of the generator on one side instead of at the bottom? As a rule the generator is not so wide as the turbine, with its accessory piping and valves, and there is more free space on the floor next to the generator than there is beside the turbine. It should be comparatively easy to provide a steel house at the side of generators to accommodate all the current transformers and delta or star buses. This would not only eliminate all crowding and complications from the air duct but would make the terminals and current transformers accessible for inspection and test, as they should be.

Perhaps it would be possible to go a step further, as has been done in the case of transformers, and furnish current transformers built integrally into the generator. At any rate, changing conditions make it advisable to check up present practices with a view to possible improvements.

Industry Dedicates a Shrine to George Westinghouse



By EARL WHITEHORNE

Contributing Editor ELECTRICAL WORLD

GEORGE WESTINGHOUSE lived again in his industry this week, when, before a vast gathering of prominent Americans and the veterans of the Westinghouse organization, a monument was dedicated to his memory. It was an expression of the pride and veneration of more than 54,000 Westinghouse employees who contributed to a memorial fund to do honor to this great man. And the occasion in itself was a recognition and a tribute such as have seldom been given in the history of industrial progress.

It was a brilliant and impressive picture: More than 800 men and women, grouped at the entrance to a wooded ravine in beautiful Schenley Park in Pittsburgh. The clear warm sunshine of a perfect autumn afternoon. Before them, bordered on either side by the broad green of two weeping willow trees, a lily pool. Beyond it, against a background of rocks and the first color of the fall foliage, the memorial. It is a large central panel flanked by two semi-circular wings, all in gold-leafed bronze, with base and insets of black Norwegian granite. In a medallion on the central panel George Westinghouse leans over his drawing board. On either side stand life-size figures in full relief—a skilled mechanic and an engineer with his slide rule. Each of the flanking wings bears three panels depicting in low relief the major events in the career of Mr. Westinghouse. Then, before the monument, placed well back from the panels, stands a bold figure of American youth, the work of Daniel Chester French. Just a boy it is, in knickers and sweater, his schoolbooks under his arm, who gazes with eager, reverent interest upon this inspiring testimonial to creative genius.

No one fortunate enough to participate in these ceremonies of dedication will soon forget the figure of this youth standing in silent revery before George Westinghouse. The boyish figure and the beautiful memorial background reflected in gleaming gold in the pool below, the throng of silent spectators, the chorus and band of Westinghouse employees, the ranks of veterans, many of them contemporary workers with George Westinghouse, and the host of distinguished guests, leaders in the electrical and railway industries, the financial and business world, massed about the speakers' platform made a vivid scene. It was impressive because this throng had come together to honor not only a great man but the ideals and qualities of greatness which that man personified. Through the characteristics of his life and work, therefore, this shrine of George Westinghouse becomes "a monument to the dignity of labor and the supreme glory of service." It is a symbol of the faith, courage and spirit of man that have built the industrial empire.

The story of the life of George Westinghouse was told in varied detail by eloquent speakers in the program of dedication and at the banquet of 700 guests of the Westinghouse organization which assembled at the William Penn Hotel in the evening. It is a romance of rich and versatile imagination, of unceasing initiative and unselfish toil in the pursuit of a broad vision of progress —a romance dramatic in its inception. A young man in his teens witnesses a disastrous train wreck in the old days of hand-braking and is deeply impressed. He becomes absorbed in the problem of promoting safety in railroading and finally conceives and produces the air brake. Against the dogged opposition of intrenched tradition and the criticism of the ubiquitous scoffer, the young man fights his way forward until he overcomes skepticism and establishes the principle of pneumatic control in transportation. He revolutionizes railway practice, first in America and then in Europe, by the sheer force of his indomitable effort and founds a great industry upon his invention. He then turns his

attention to the possibilities of automatic signaling for railroads, establishes the principles in use today and organizes still another company to manufacture this safety device. In commenting at the banquet on these two contributions, James M. Beck voiced the opinion that Mr. Westinghouse had done more than any other one man to fulfill the prediction of George Washington that the progress of the American nation depended above all else upon the development of the economic bonds of contact and communication between the states. For it was through the control of trains by air brake and signaling that the expansion of railway transportation become possible.

The achievements of George Westinghouse in the field of electrical invention and manufacture were no less spectacular and constructive. He became the champion of the new principle of alternating current, believing that it would solve the perplexing problems involved in the transmission of power. He journeyed to England in 1885, purchased the transformer patents owned by Goulard and Gibbs and the next year organized another industry for the manufacture of electric lighting apparatus. The story is well known to all electrical men. He engaged Nikola Tesla, a young European scientist of great talent, to collaborate in the development of the alternating-current induction motor. He fought a crusade against the most bitter opposition and in 1892, by his personal efforts, obtained the contract to light the Chicago World's Fair and achieved a brilliant demonstration of the efficiency of his alternating-current system. Two years later he erected the world's first important hydro-electric system at Niagara Falls. He perfected the first alternating-current electric locomotive and was a pioneer in the early American development of the steam turbine —all major milestones in his progress. Meanwhile he pursued an inventive activity of astonishing proportions, embracing a complete automatic control telephone exchange system, an automatic coupler for air, electric and train connections, a system of piping and meters for natural gas, an air spring for automobiles and innumerable other patentable inventions of a surprising diversity that in many cases mirrored an uncanny vision of future possibilities.

The central panel of the memorial in gold-leafed bronze and black granite

And this in addition to the organization and administration of a group of industries whose operations embraced, in addition to America, Great Britain, France, Italy and Russia and involved the vicissitudes of repeated financial stress and reorganization—the price of continuous pioneering and expansion. He died in 1914, at the age of 68, rich in the record of achievement and in honors received at the hands of his countrymen, from rulers and from kings. He left behind him industries upon which 200,000 people were dependent for their wellbeing.

George Westinghouse was one of those great and unique figures who at rare intervals cross the pages of history. It is impossible to measure him in terms that apply to ordinary men. He patented over 400 inventions, but he was not primarily an inventor. He founded scores of successful companies, but he was in no sense a promoter. He made millions for himself and others, but he cared nothing for money for its own sake. He directed many vast engineering undertakings, but he cannot be considered merely an engineer. He was one of the most impressive figures, one of the most dynamic forces of his generation, and he applied his gifts and his ability for the benefit of humanity. He contributed greatly to the material development of his country and the world at large and, because of the universality of his work and genius, belongs not only to America, but to the world.

James Francis Burke, in the dedicating address before the monument, stressed the abiding confidence of Westinghouse in the destiny of his country. He said:

"George Westinghouse's inventions and industries were not the only heritage he handed down to his successors. His faith in himself and in the future of America were outstanding features of his life. He transmitted that faith, and all the inspiration it imparts, to those who came after him.

"No more striking example of the value of men who in periods of depression and adversity keep their heads cool and their faces to the front can be found in American industrial history than his unceasing faith and fighting spirit during the most discouraging period of his financial and industrial career.

"The instrumentalities he created and the forces he set in motion enabled him, not only during his life, but in a greater measure after death, to triumph on the battlefields of peace, for there, after all, the most enduring of all man's victories are achieved. And in the light of the history that followed how strikingly was his faith and judgment vindicated!"

A. W. Robertson, chairman of the board of the Westinghouse Electric & Manufacturing Company, speaking as toastmaster at the banquet, paid this tribute:

"George Westinghouse was like the rest of us in that he had two eyes with which to see, two ears with which to hear and the usual physical attributes that are common to all of us. In this sense he was an ordinary man—but here the 'ordinary' ceased and the 'extraordinary' began. His eyes were not limited to seeing the world of his day only, but he had the vision of a prophet and a seer—to look into the future.

"He was among the first of living men to visualize two generations ago the present age in which we live. He saw clearer than other men that the time would come when the wasted energy of the waterfall and the sleeping energy of the coal mine would be turned into the restless energy of the electric current, spreading everywhere throughout our country, to be the ready servant of the world. He had the energy of an army. He conceived and carried on huge projects. He rushed from one to another with unabated zeal. His was the faith that moves mountains. He had the courage that is equal to every emergency. His is an immortal name.

"He passed away a decade ago, and yet his name is better known than before his passing, and today we delight to honor him. No history of America or of the nineteenth century will be written without the name 'Westinghouse.' It is known in every language and in every land. So I consider it no idle statement to say that he belongs to that few hundred whom the world remembers and continues to honor.

"The bronze monument which we have dedicated this day to his memory in Schenley Park will endure as long as our present civilization lasts. We have erected it, not in the thought of making his name and achievements live, for they will endure regardless of monuments or bronze, but rather as a permanent expression of the love and respect which the men and women of Westinghouse have for him and his memory.

"His career was typically American. He was born without riches but in his lifetime he gathered riches and honors of untold worth. He saw his dreams come true. The products of his laboratories and shops, children of his brain, are known in the far-flung corners of the earth.

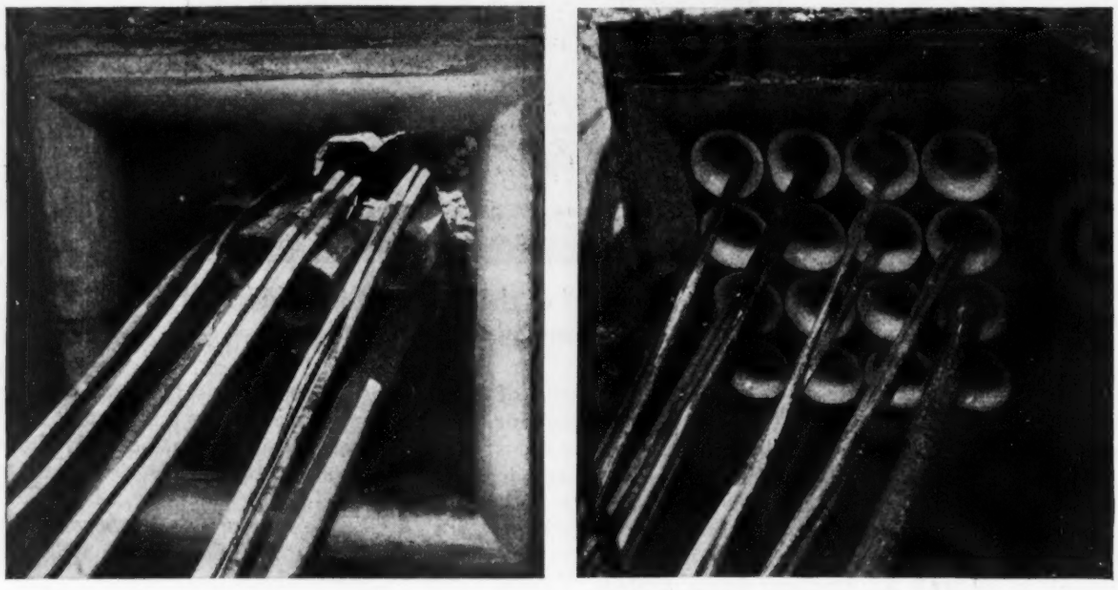
"If by any chance tonight he looks down from the ramparts of Heaven upon this great gathering in his honor, may we express the wish that his spirit has free access to the workshop of the universe, the research laboratory of the skies. If he accomplished so much in the space of one short lifetime, what marvelous radiant instruments may one visualize his restless brain creating in the eternal, changeless years of those who dwell on the other side of time! May he work there without being weary!"

▼ ▼ ▼

Making It Easier to Add Manholes to Duct Lines

EXTENSIONS to underground distribution systems often require cutting new manholes into existing duct lines, and the problem of disturbing service as little as possible is always present. At Fall River, Mass., the local power company utilizes split concrete duct framing and porcelain bells effectively in this work. When the excavation for the new manhole has been made and forms set, or brick laid, openings are left around the ducts, a split precast concrete frame being placed around the ducts and cables as shown in the accompanying illustration. The cables are then protected with Beauregard porcelain bells, which are easily split with a cold chisel, the halves later being fastened with iron wire terminating in loops, through which stove bolts are placed to draw the halves together. The spaces between the bells are filled with concrete flush with the straight part of the frame, binding the entire duct opening securely.

Besides a considerable saving in labor, this method permits practically continuous use of the cables during the entire period of adding to the manhole.



Split frame in position and bells used in cutting in duct line

Economical Load Allocations

By HERBERT ESTRADA

Superintendent of Station Economy
Philadelphia Electric Company

IN DETERMINING how the loads should be most economically allocated to individual generating stations in an interconnected power system it is necessary to know the performance characteristics of each plant in the system.

THIS paper deals with the basic data which are used in arriving at an economical system of load allocation and its application in checking plant operation and in determining the increment costs of economy energy sold to or purchased from interconnecting companies.

FOR determining how loads should be most economically allocated to generating stations in an interconnected system it is necessary to know the performance characteristics of each station. Station performance curves are based on accurate performance tests of all pertinent equipment, the tests having been conducted with the apparatus in the best possible operating condition. The heat balance calculations, which are made by combining the tests of the individual equipment into station performance curves, are the same sort of performance calculations that are made in design of a station. Daily performance curves are calculated from typical daily load studies by summating the individual hourly performances for the day, computed from the hourly plant performance curves. In working out the station performance curves, the most economical operating and loading schedules for individual equipment in the plant are developed. These schedules are submitted to the plant operating forces, who are thereby guided in properly determining the number of boilers to be used for given loads, relative boiler or turbine loading, and auxiliary equipment schedules. For detailed information on the preparation of the plant performance curves the reader is referred to the N.E.L.A. prime movers committee serial report 278-101 on power station betterment, September, 1928.

One of the plant performance charts for a generating station having two turbo-generators and twelve boilers is shown in Fig. 1, giving the relation of hourly coal consumption to gross kilowatt output for 32 deg. F. and 80 deg. F. condenser circulating water injection temperatures and for a varying number of boilers under fire. The total coal consumption, based on coal having a standard heating value, is obtained from the sum of parts A, B, and C given by the curves. Part A gives the banking or no load coal per hour for the number of boilers under fire. Part B gives the coal required per hour as a function of the gross kilowatt output with all the boilers in the station under fire. Part C gives an adjustment for a less number of boilers under fire, the adjustment resulting from the decrease in boiler efficiency with increase in rating.

The daily performance curves for the turbine plant expressed in per cent of average turbine plant B.t.u. rate are shown in Fig. 2 for 32 deg. F. and 80 deg. F. condenser circulating water injection temperatures. The adjustment B.t.u. rate shown below the main curves

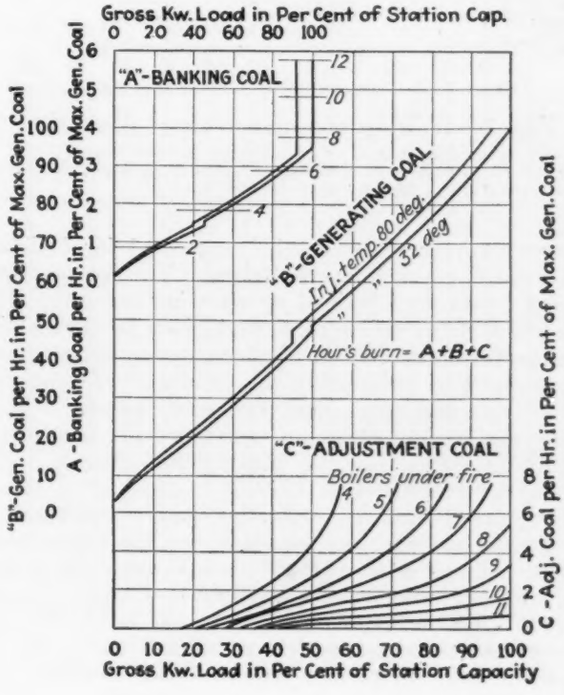

Gross Kw. Load in Per Cent of Station Cap.
0 20 40 60 80 100
"A"-BANKING COAL
12
10
8
6
4
2
"B"-GENERATING COAL
Inl. temp. 80 deg.
" 32 deg
Hour's burn= A+B+C
"C"-ADJUSTMENT COAL
Boilers under fire
4 5 6 7 8 9 10 11
"B"-Gen. Coal per Hr. in Per Cent of Max. Gen. Coal
A - Banking Coal per Hr. in Per Cent of Max. Gen. Coal
C - Adj. Coal per Hr. in Per Cent of Max. Gen. Coal
0 10 20 30 40 50 60 70 80 90 100
Gross Kw. Load in Per Cent of Station Capacity

Fig. 1—Plant performance chart

Two turbo-generators, twelve boilers. Relation of hourly coal consumption to gross output for 32 deg. F. and 80 deg. F. circulating water intake temperature.

is negative and gives corrections for various numbers of boilers under fire, the adjustment resulting from the increase in superheat delivered with increase in boiler rating.

Check of operation

Station performance curves show what the plant should be able to do if all equipment were in the best operating condition and properly operated, and, therefore, establish a goal or bogey for the station forces to strive for. The men in the plant are constantly on the alert to improve economy, knowing that their efforts will appear in the check of actual coal consumption against the bogey coal consumption, as given by the station performance curves. This check is corrected for fuel heat value and is continually maintained. Turbine plant operating losses are obtained by checking the actual turbine plant B.t.u. rate against that given by the turbine plant performance curves. Boiler plant operating losses are obtained by subtracting the turbine plant operating losses from the total plant operating losses. Fig. 3 shows the weekly check of operation of one of the generating stations in the Philadelphia Electric Company system for the year 1929.

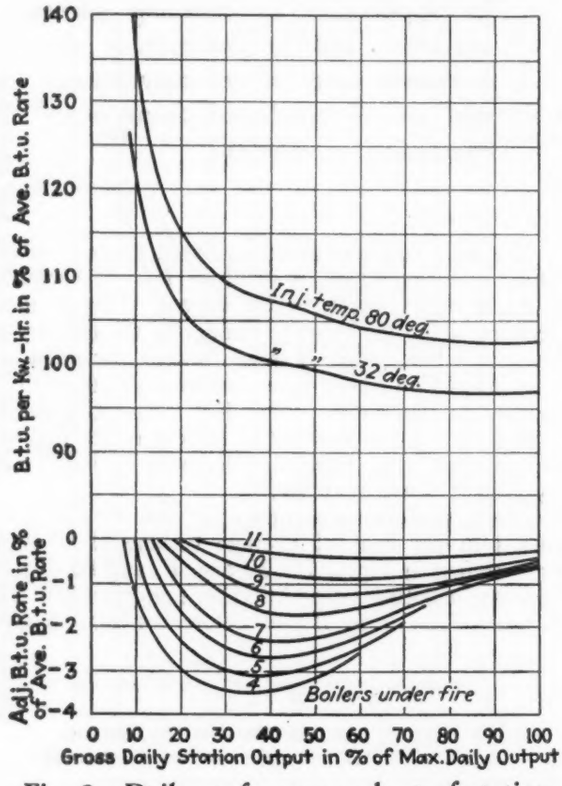


Fig. 2—Daily performance chart of station

Expressed in per cent of average turbine plant B.t.u. rate for 32 deg. F. and 80 deg. F. circulating water intake temperatures. Station data in Fig. 1.

The curves show the operating losses, expressed in per cent of the bogey or standard, for the boiler room, turbine hall and entire plant. It can be seen that a very creditable performance was obtained in the plant during the year. By means of these checks any increase in operating losses can be quickly noted and the necessary measures taken to correct uneconomical operation.

Heat balance calculations for the station performance curves are also used in obtaining the increment coal rate curves for the station. The increment coal rate curves greatly simplify the task of properly allocating the system load to the individual generating stations, and are also useful in determining increment costs of so-called economy power purchased from or sold to interconnecting companies.

The increment coal rate may be defined as the pounds of coal required to produce an increment of one kilowatt-hour in the net station output. It corresponds to the slope of the tangent at a given load on the hourly coal consumption curves shown in Fig. 1. The increment coal rate varies with station loading, condenser injection circulating water temperature and also with the number of boilers which are under fire.

In Fig. 4 are shown the increment coal rate curves for the generating station, the performance curves for which are shown in Figs. 1 and 2. The increment coal rate values expressed in per cent of average station coal rate are shown as a function of station load, expressed in per cent of station capacity, for 32 deg. F. and 80 deg. F. condenser injection circulating water temperature. Adjustments are given below the main curves for the number of boilers which are under fire in the station. This adjustment is added to the value given by the main curves to obtain the total bogey increment rate. The main curves are for the maximum number of boilers under fire.

Increment rate in the overload region of the turbines

A sufficient number of turbo-generators are carried on the system at all times to maintain the load in the event of the failure of the unit of largest capacity. All machines, in general, are provided with overload valves, where the increment coal rate is from 12 to 20 per cent greater than in the normal load region. This overload capacity should, therefore, be used as far as possible in providing reserve for the outage of the largest unit of capacity on the system. To make the increment rate curves, Fig. 4, more readable, the overload increment rate for the first main unit on the line has been omitted. In other words, the curve is worked out on the basis that the next machine is put on the line just before the overload valves open on machine already in service. Addition of the second unit on the line, Fig. 4, increases the coal consumption from 3.3 to 4.7 per cent of the maximum coal consumption, depending on the injection temperature. This increased coal consumption must be balanced against the increase in increment rate in the overload region to determine how much overload capacity should run before an extra unit is placed on the line in advance of reserve requirements.

Inasmuch as the increment coal rate curves are derived from the same heat balance calculations as the coal bogeys which are used to check the performance of the generating stations, the margin by which the actual coal consumption exceeds the bogey coal consumption should be used in correcting the bogey increment coal rate to actual conditions. This margin is approximately 2 per cent, giving a factor of approximately 1.02 by which to multiply the bogey increment coal rate values in order to correct the actual plant conditions.

In general, all the power which is generated at any particular station is not distributed at that station. A considerable portion of the power may be transmitted from one station to another. For such transfer to be economical, the increment cost of power at the station which is sending the power must be lower than the increment cost of the station receiving the power, in order to compensate for the additional transmission line loss. To facilitate the determination of the additional loss incurred by transmitting the power over tie lines from a generating station to a distributing station, transmission line increment loss curves, Fig. 5, have been developed. These curves show the relation of per cent increment line loss to transmission line loading. The per cent increment loss on any transmission line for a particular loading may be defined as the ratio of the increase in loss due to a small increase in load to the increase in load. Mathematically, it is the derivative of the loss with respect to the load. Inasmuch as the loss on a transmission line is proportional to the second power of the load, the derivative of the loss with respect to the load is proportional to the first power of the load, and, hence, is a linear function of the load.

The formula for the increment loss of a three-phase balanced transmission line may be derived as follows:

Let R = Line resistance
I = Line current
KVA = Total 3-phase transmitted kva.
KW = Total 3-phase transmitted kw.
$RKVA$ = Total 3-phase transmitted reactive kva.
KV = Line voltage in kilovolts.

Then

$$KW \text{ loss} = \frac{3\,R\,I^2}{1{,}000}$$

$$= \frac{3\,R\,KVA^2}{1{,}000\ 3\ KV^2}$$

$$= \frac{R}{1{,}000\ KV^2}(KW^2 + RKVA^2)$$

Thus the KW loss is composed of two parts, one varying as the square of the KW and the other varying as the square of the transmitted reactive KVA, each part of which is independent of the other.

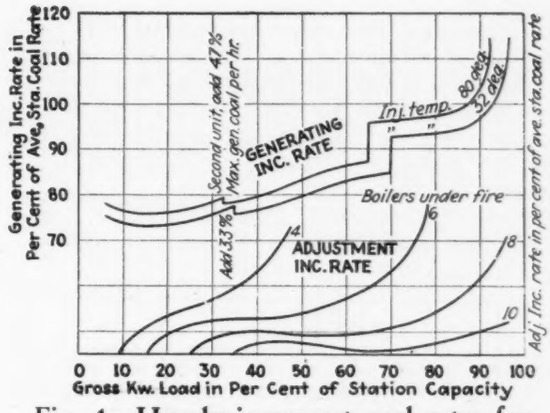


Fig. 4—Hourly increment coal rates for generating station

Data apply to performance curves of Figs. 1 and 2.

Hence, differentiating,

$$\frac{d\ (KW \text{ loss})}{d\ (KW)} = \frac{R}{1{,}000\ KV^2}\ (2\ KW)$$

$$\text{Per cent increment loss} = \frac{100\ d(KW \text{ loss})}{d(KW)}$$

$$= \frac{R}{10\ KV^2} \times 2\ KW$$

$$= 0.2\ R \times \frac{KW}{KV^2}$$

The above formula assumes that the reactive component of the power is constant. A similar formula can be used independently to express the reactive power increment loss.

In using the curves, for example, to determine the additional loss incurred by increasing the load on the Plymouth Meeting-Westmoreland lines from 100,000 kw. to 110,000 kw. the average increment loss for the 10,000 kw. is found at 105,000 kw. to be 3.9 per cent = 390 kw. In a similar manner all the major transmission line losses may be computed.

Control of the system load and responsibility for the economical allocation of the system load to the individual generating stations can be conveniently centralized in the

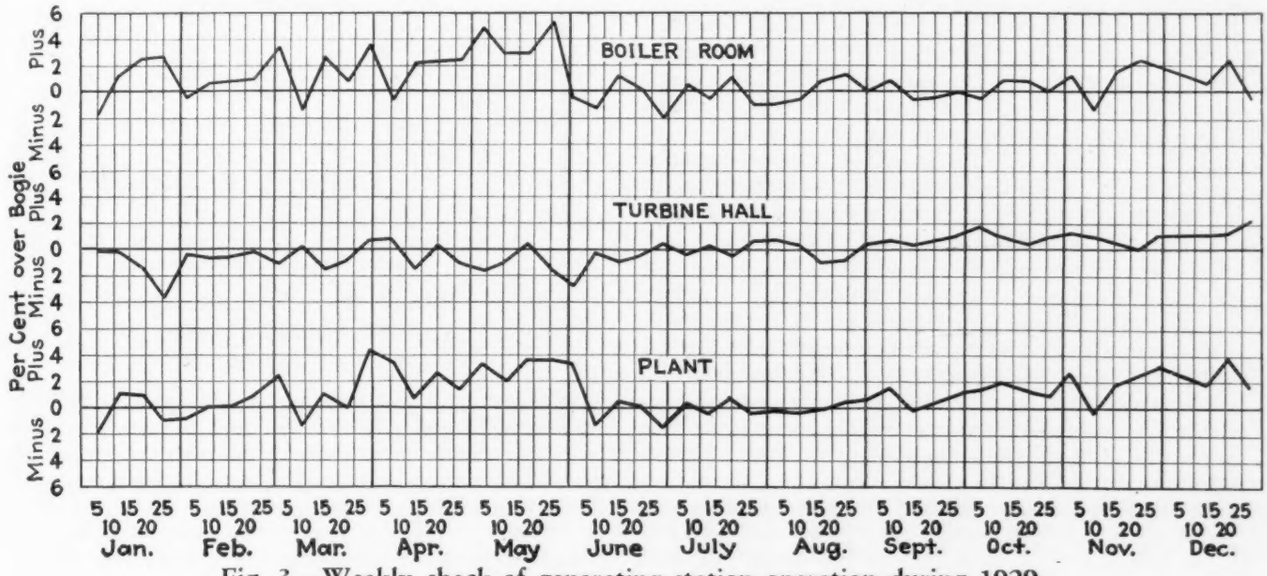


Fig. 3—Weekly check of generating station operation during 1929. Bogey based on test performance charts

load dispatcher's office, where the responsibility is placed for instantly meeting the power demands in all parts of the system. The load-dispatching office is the nerve center of the system and the installation of the proper communicating and remote metering facilities in this office aids greatly in obtaining the maximum in system economy.

The men in the load dispatcher's office should be thoroughly acquainted with the general problem of

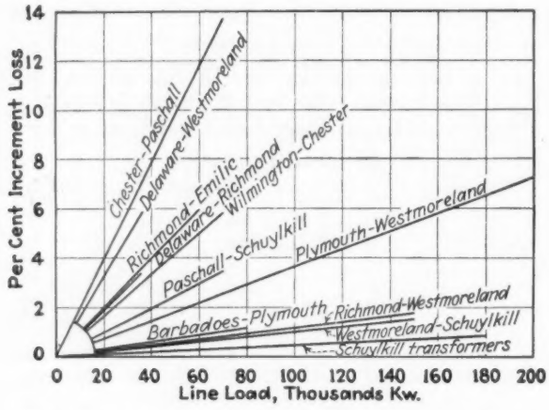


Fig. 5—Transmission line increment losses

economical system operation, inasmuch as unusual conditions are bound to occur which can be efficiently handled only if the men on the job have an understanding of the variables involved in correct load allocation.

It would be extremely laborious, however, for the load dispatcher to work out the proper allocation for each individual load as it occurs from the station increment coal rate and transmission line increment loss curves. These allocations can be worked out accurately beforehand and the information shown on a steam load allocation chart, Fig. 6; this chart shows the most economical allocation of load to the individual steam-generating stations for each total steam load. The Philadelphia Electric Company load is partially supplied by water power developed at Conowingo, which is a run-of-river hydro plant. Allocation of load to Conowingo therefore depends on the flow of the Susquehanna River, and consequently the amount of load allocated to hydro must be determined before the remaining steam load can be allocated to the individual steam-generating stations. The Conowingo load is allocated so as to develop the full energy from the river and at the same time give the maximum steam system economy.

In working out a steam load allocation chart the problem is to obtain a minimum system coal consumption per kilowatt-hour delivered from the transmission system rather than a minimum net system coal rate on the basis of the steam station output. The energy which is delivered by the transmission system is not metered, so that it is possible to obtain excessive transmission line losses without any direct knowledge of the fact. As was stated previously, the increment coal rate depends on the number of boilers carried. The number of boilers carried on any station varies throughout the year due to the variation in peak load. In the steam load distribution curves a yearly average of the number of boilers has been used. This has been found to give accurate enough results, so that the calculation of different steam load allocation charts for various boiler combinations has not been warranted.

In developing the steam load allocation chart, a typical system load set-up, similar to that shown in Fig. 7, is made for each load and the proper allocation obtained by the "cut-and-try" method, too many variables being involved to arrive at a direct result. In arriving at each load set-up, it is necessary to estimate the distributed load at each distribution point, this latter being necessary in order to evaluate transmission line increment losses.

Starting with the minimum load on all steam-generating stations, the load on the station having the lowest increment coal rate is increased until a load is reached such that the increment coal rate at this station corrected for transmission loss to the next best station is equal to the increment rate at the next best station. At this point the second station also has its load increased so as to maintain its increment rate equal to that of the first station corrected for transmission line loss. This process is continued until all stations are brought up to their maximum capacity.

The criterion for correct load allocation is that the load shall be increased on that steam-generating station having the lowest increment coal rate corrected for transmission line increment loss. An important consideration with reference to load allocation is the number of main units to have on the line. At the lower loads the number of units is determined by the amount of reserve for which it is necessary to stand by. In this case the station increment coal rate value given by the curves in Fig. 4, corrected by the operating factor, are used directly in determining the correct allocation of load by the "cut-and-try" method.

At the higher steam loads, or if the amount of re-

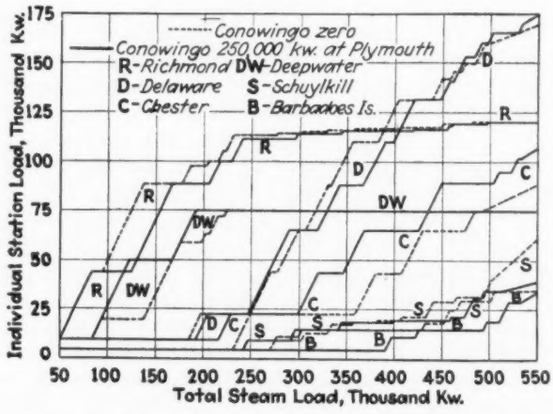


Fig. 6—Typical steam load allocation chart for interconnected system

serve to carry is not very large, it may be economical to place additional turbo-generators in service in advance of reserve requirements, in order to reduce the amount of power generated in the overload region of the turbines where the increment coal rate is from 12 to 20 per cent greater than in the normal region. If a machine is placed on the line for economical reasons, the increment coal rate must be increased by approximately 11 per cent due to additional no-load coal con-

sumption on the unit. This correction is obtained by dividing the no-load coal consumption on the unit by the most economical turbine loading in order to prorate the no-load consumption over the probable turbine load.

The load on the other stations should be increased so that their increment coal rate corrected for increment transmission line losses are equal to the higher value of the increment coal rate at the particular station. That the higher value of the increment rate should be used in this case in balancing against the increment rate at the other stations is apparent when it is considered that by increasing the load on the other stations the time when an additional turbo-generator is necessary is delayed and the number of turbo-generators on the line will be reduced. This will result in a no-load coal saving, at the partial expense, however, of increasing the increment rate at the other stations.

In using the curves, Fig. 6, the Conowingo hydro load must be subtracted from the system load to obtain the total steam load. The subdivision of this load among the various generating stations is given by the curves. Inasmuch as the loading on the transmission tie lines, and hence the loss, is materially affected by the variation of the amount of hydro power supplied to the system, the load distribution chart, Fig. 6, has been worked out for the two cases of no hydro power and maximum hydro power. For other values of hydro power it is necessary to interpolate between the curves. Interpolating for intermediate hydro loads, the load dispatcher must be careful not to put more machines in service than necessary for economy or reserve. In illustrating the use of the chart, assume that the system load is 480,000 kw. and that Conowingo is delivering 200,000 kw. The steam load is then 280,000 kw. For this steam load and with Conowingo delivering 200,000 kw., the allocation is as follows:

	Kw.		Kw.
Richmond	112,000	Chester	22,000
Deepwater	75,000	Schuylkill	10,000
Delaware	54,000	Barbadoes	7,000
		Total	280,000

The system load set-up for these conditions is shown in Fig. 7. It will be noticed that with no hydro power Barbadoes Island generates more load than when the hydro power is equal to 250,000 kw. The reason for this will be obvious by referring to Fig. 7. When Conowingo is delivering maximum power to Philadelphia there is considerable loss on the Plymouth Meeting-Westmoreland transmission lines. By delivering more of this power to the Barbadoes Island line at Plymouth Meeting, thus reducing the Barbadoes Island generation, the load on the Plymouth Meeting-Westmoreland lines would be reduced where the increment line loss is high.

Determination of the increment cost of power to interconnecting companies

Philadelphia Electric Company is interconnected with two other major utilities and economies are being realized by the exchange of so-called economy power between the various parties of the interconnection. This economy power is sold when the increment cost of power of one company is less than that of another, thus making the transaction economical. In order to determine whether a transaction is feasible, each company must work out the increment cost of a definite block of power sold or the incremental reduction in costs by purchasing a definite block. In working out these costs, the increment coal rate curves, Fig. 4, are used for the particular station or stations supplying the power or whose load is being reduced. It is also necessary to determine the increment maintenance costs on these stations, and these are added to the fuel cost to obtain the total increment cost at the station. By setting up the tie-line loadings, before and after the transaction, on a chart similar to that in Fig. 7, and by means of the transmission line increment loss curves shown in Fig. 5,

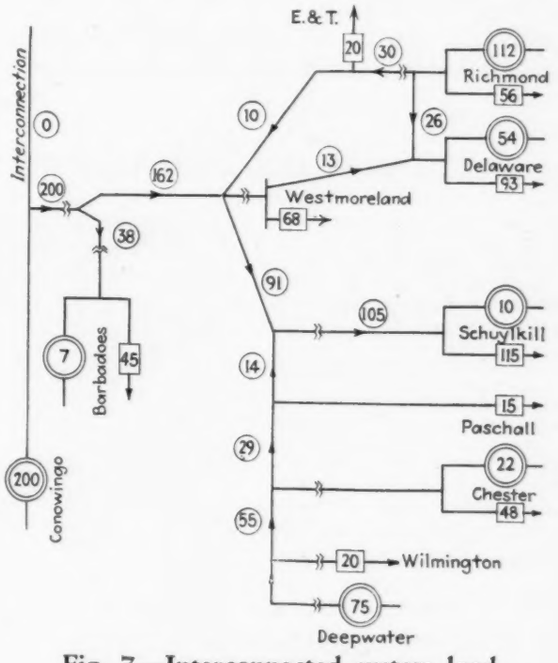


Fig. 7—Interconnected system load distribution diagram

System load, 480,000 kw. Conowingo hydro generated load, 200,000 kw. Steam-generated load, 280,000 kw.

the increase or decrease in transmission line losses to the metering point of the power is determined for the transaction. The increment costs of the power at the station is then corrected to the metering point by the following formula:

$$\text{Increment cost corrected to metering point} = \frac{100 \times \text{Increment Cost at Station}}{100 - \%\ \text{Transmission line increment loss}}$$

Transmission line increment loss is obtained by dividing the increase or decrease in transmission line losses by the amount of power sold or purchased. In applying the foregoing formula, the per cent increment loss must be used with regard to sign. The formula applies as it stands to an increase in loss. If the transmission line loss is decreased, the negative sign in the denominator becomes positive. The station whose load is increased or decreased by the transaction can be determined from the steam load allocation chart, Fig. 6.

Results of allocation

The economical system of load allocation previously described has been partially responsible for the high system economies obtained by the Philadelphia Electric Company. The following tabulation shows the B.t.u. rate on each station for the year 1929, expressed in

per cent of the average steam system B.t.u. rate and also the station capacity in per cent of the total steam system capacity:

Stations	B.t.u. per Net Kilowatt-Hour—1929 Per Cent of Steam System B.t.u. Rate	Station Capacity Per Cent of Total Steam Capacity
Richmond	81	20.5
Chester	104	21.5
Delaware	107	30.8
Barbadoes Island	133	5.1
Schuylkill No. 2	157	11.1
Schuylkill No. 1	351	11.0
System	100	100.0

The B.t.u. rate on the best station, Richmond, was only 19 per cent better than that of the system in spite of the fact that the capacity of Richmond is only 20.5 per cent of the total steam capacity; also, the system B.t.u. rate was better than that of all the other steam stations, with the exception of Richmond. This performance has not been made at the expense of high transmission loss, as the transmission loss element has been taken into consideration, as previously explained. The operation of Conowingo on base load during the high river flow period of approximately three months makes it necessary to carry the peak portion of the system load on steam, and during this period the steam system economies are affected adversely. In spite of this factor, the yearly steam system efficiencies obtained by the Philadelphia Electric Company rank with the best.

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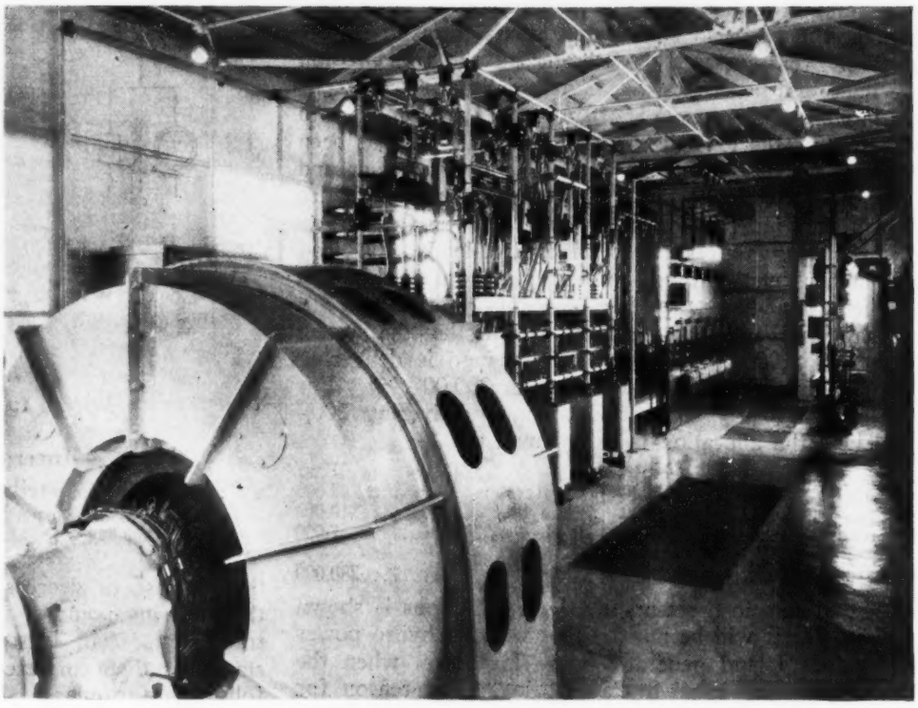
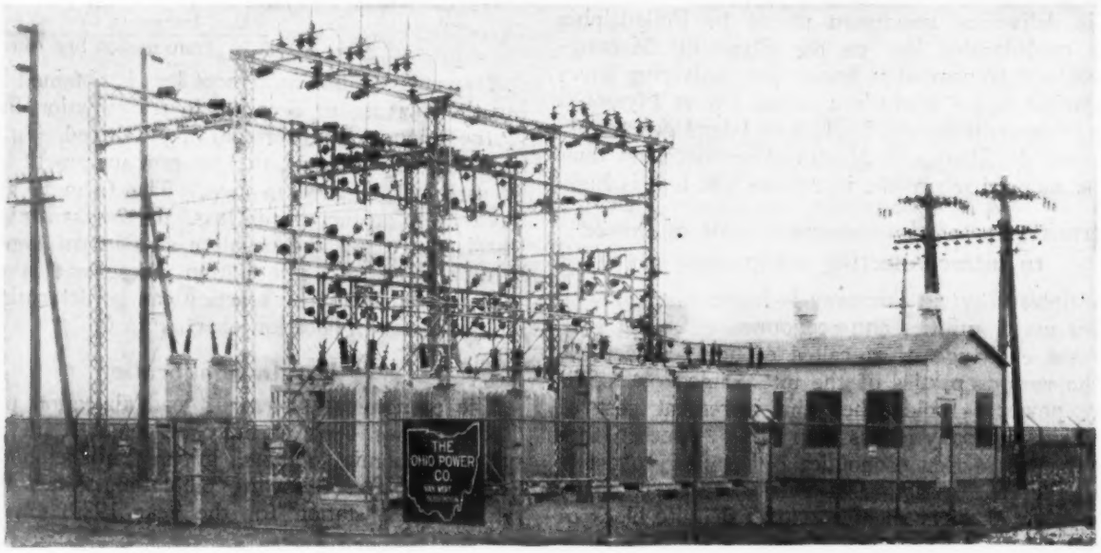
Low-Cost Substations Need Not Be Unattractive

Proceeding upon the assumption that economical types of construction are not necessarily either engineering compromises or nuisances to the public eye, the engineers of the American Gas & Electric Company have produced several which prove their contention. The Van Wert substation of the Ohio Power Company contains a 2,500-kva. automatic synchronous condenser and switching equipment and provides ample clearances, neat arrangements, safety and full working space, yet is of sheet-metal construction, walls and roof. As shown in the accompanying illustration, the outside appearance offers no encouragement to even the most eager critic of utility practices.

Minimization of outdoor steel work has also aided in producing an unobtrusively effective structure. Fully weatherproof design of walls and roof not only makes operation, maintenance and performance of equipment certain and invariable but adds to the life of the structure.





Cable Quality Is Improving

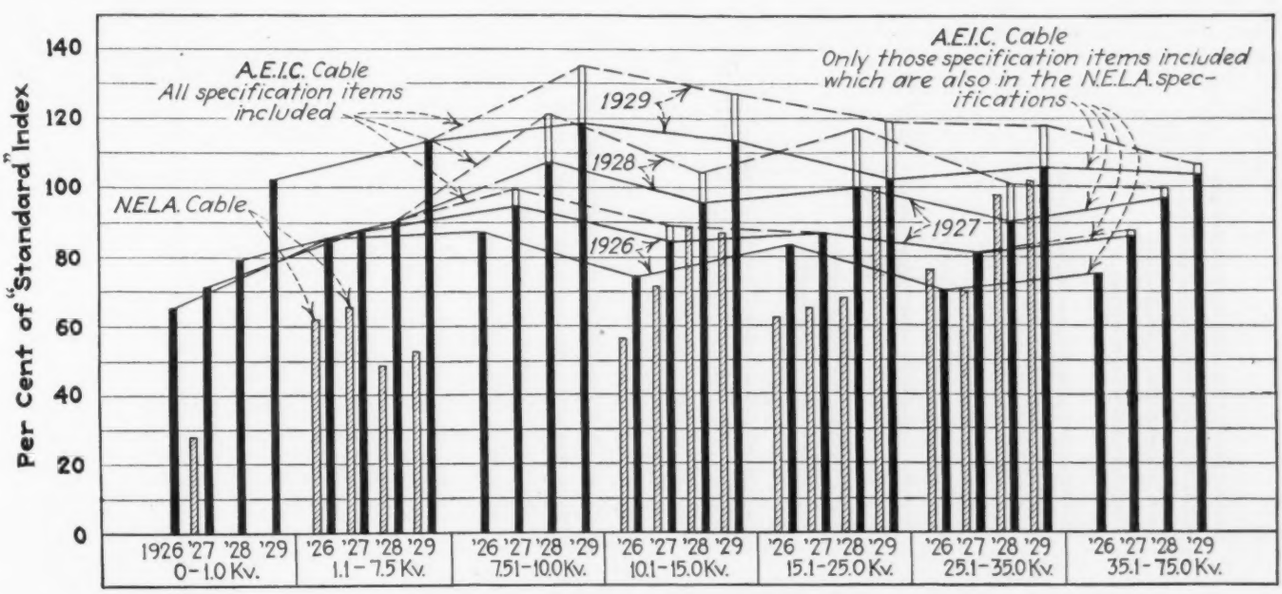
Arbitrary index improves, but some uncertainty rests in cable-length averages. What are the variations in each foot of length?

IN MORE than 500,000 ft. of cable inspected under N.E.L.A. specifications the amount deficient was 3.20 per cent, representing the lowest percentage reached under those specifications. Likewise, in nearly 8,500,000 ft. inspected under A.E.I.C.* specifications the 2.32 per cent of deficient cable is the lowest percentage obtained to date, according to a report of the underground systems committee, Engineering National Section, N.E.L.A. Deficiencies were in most cases due to voltage failures, thin insulation, papers torn in bending test, and excessive over-all diameter. In the routine factory voltage tests made in 1929, the 1,091 reels tested under N.E.L.A. specifications showed no failures and the 11,363 reels tested under A.E.I.C. specifications had a failure percentage of only 0.08.

All tests, regardless of the time for each voltage breakdown, are reduced to a common basis for comparison by computing the one-hour equivalent dielectric strength: that is, the equivalent voltage which should cause failure at the end of one hour. These equivalent values are based on the assumption that the life varies inversely as the sixth power of the test voltage in single-conductor and shielded multi-conductor cable, and inversely as the seventh power of the test voltage in belted multi-conductor cable. The fairly consistent upward trend in the dielectric strength of the cable after bending which has been noted in the past still persists. The average strength in volts per mil average gradient was 13.5 per cent higher in 1929 than in 1925 for N.E.L.A. cable and 56.5 per cent higher for A.E.I.C. cable.

In the dielectric strength tests on belted multi-conductor cable the test is usually conducted in such a manner that a failure is first obtained between conductors. The net likely result, then, is that either the test between conductors and sheath is not completed or the value obtained in that test is lowered due to damage done to the cable in the between-conductor failure. The aver-

*Association of Edison Illuminating Companies.



Cable shows improvement in quality

The evaluation of inspection and test data during the period 1926-1929 indicates a steady rise in per cent of "standard."

In determining per cent of "standard," cable just meeting A.E.I.C. specifications is considered to have zero "quality." Cable which is believed to be satisfactory from the standpoint of operation is arbitrarily set at 100 per cent "quality." Any cable surpassing this standard is rated above 100 per cent in direct proportion to the excess.

age dielectric strengths of 1929 cable are all higher by 5 to 10 per cent, and the average short-time breakdown strength was well over 550 volts per mil.

Power-factor-temperature data taken over a period of years on all voltages and sizes of cable combined shows that the average power factor versus temperature characteristic has remained substantially constant. Data from nearly 9,000 tests on ionization give average ionization factors for the various types of cables as 0.15 per cent for single-conductor cable, 0.12 per cent for the shielded multi-conductor cable, and 0.28 per cent for the belted conductor cable. The tensile strength for both manila and wood pulp paper dielectrics has changed little during the past three years, though wood pulp paper has shown an upward trend in the tests parallel to the tapes. However, the tearing strength has fallen off in 1929 as compared to 1928.

The "quality" of the cables, which is obtained by the evaluation of inspection and test data, has apparently steadily improved since 1926, as is shown in the accompanying figure. Each succeeding block in each voltage class is higher than the preceding one, and this is true of all voltage classes as emphasized by the line connecting the tops of corresponding blocks.

Although there appears to have been an improvement in the "quality" of cable of nearly 30 per cent in only three years, it should not be concluded offhand that that is actually the case. In the first place these indices are based solely on the inspection and test results, and in the second place these results are weighted and combined in a purely arbitrary manner. It may be that too much weight has been put on the various dielectric strength tests, so that the apparent improvement which has taken place in this property of cable has raised the "quality" index out of proportion to the real improvement in overall quality. The only certain measure of quality is the performance in service, and only by a careful comparison of these evaluation data with the service records is it possible to determine whether or not this method of predetermining "quality" is justifiable.

Although progress has been made in recent years in cable testing, the dielectric loss, power factor and ionization tests give only average results, whereas the report says these properties should be known in every foot of insulation. Neither is there any means of accurately checking the size of the conductor, which is the most important element in the cable. Also, the thickness of the lead sheath can only be measured at the ends of the section of cable, and there is no way of detecting thin lead on the cable away from the ends. However, the process employed in fabricating cable is a good protection against this defect.

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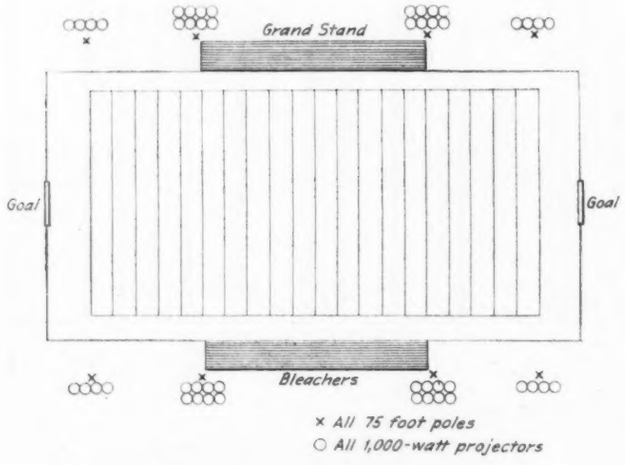
Football Floodlighting Increases Attendance

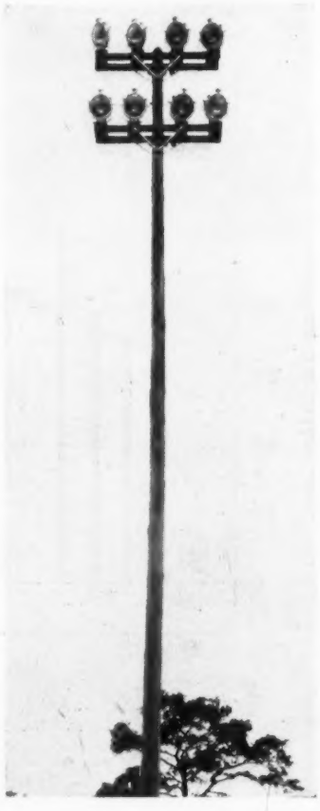
By W. E. BANN
Vice-President Southwestern Gas & Electric Company, Texarkana, Ark.-Tex.

FOOTBALL attendance 30 to 50 per cent greater at night than in the daytime is the result of floodlighting Grim field of the Junior College and the high school of Texarkana, Ark. The installation totals 48,000 cp., which is felt to be the minimum for adequacy. In the games played no punts have passed outside of the light area and no difficulty has been found in following every play. A white football is used, but this has been found not to be necessary with the maximum of 10 and the average of 8 foot-candle intensity on the field.



Plan of Texarkana football field showing disposition of light sources

The installation consists of eight 75-ft. creosoted pine poles supplied by the International Creosoting & Construction Company, Texarkana, and 48 Westinghouse C.A. 16-in. "Chromolite" reflectors with stippled lenses, each containing a 1,000-watt lamp. The installation was sold by J. D. McCarty, merchandising manager of the Southwestern Gas & Electric Company, and its construction was supervised by R. P. Johnson of the Westinghouse company.



Eight 1,000-watt projectors are mounted on each of four central 75-ft. poles

Code of Ethics for Contractors

(Abridged)

Proposed by Association of Electragists, International to bring about better business relations among contractors and with customers and jobbers and to raise standards of the trade and induce higher grade wiring. Subject to approval of Federal Trade Commission.

Condemned Practices

Inducing Breach of Contract

Knowingly to submit a bid after a contract has been awarded to a competitor, with the intent of injuring the competitor, or inducing or attempting to induce the breach of a contract between a competitor and his customer, is an unfair trade practice.

Defamation of Competitor

Dissemination of false or misleading information relative to a competitor's business integrity, his ability to perform work, his credit standing, or the quality or reliability of his materials is an unfair trade practice.

Selling Below Cost

The furnishing or selling of services or materials at or below cost for the purpose of injuring a competitor with the effect of lessening competition is an unfair trade practice.

Evasion of Rules and Regulations

To use methods of installation of electrical work not in accord with the applicable governmental laws, rules and regulations obtaining in the territory affected is an unfair trade practice.

Substitution of Inferior Materials

To use or to substitute materials in an electrical installation inferior in quality to those specified by the purchaser, without his knowledge or consent, or to those required by the applicable governmental laws, rules and regulations in the territory affected, is an unfair trade practice.

Enticement of Employees

Interference with a competitor's business through the enticement of his employees from his employment is an unfair trade practice.

Price Discrimination

The secret payment or allowance of rebates, refunds, credits or unearned discounts, whether in the form of money or otherwise, as a means of effecting or concealing price discrimination, or secretly extending to certain purchasers of special privileges, including discriminatory allowances for engineering, architectural or other services, not extended to all purchasers under like terms and conditions, is an unfair trade practice.

Unfair Practices in Bidding

The willful obtaining of and using surreptitious advance information relative to competitors' bids in the preparation of one's own bid is unfair and is condemned by the industry.

For any person, firm or corporation to aid or abet another engaged in unfair trade practices is condemned by the industry.

"Shopping" of Bids

It is a frequent practice for electrical contractors to submit bids to general contractors, who in turn use the lowest acceptable price from the several trades in making up their bids on a general contract. Many general contractors after securing the general contract then reopen the bidding for the same operation, commonly known as "shopping," which practice lowers the standard and quality of electrical installations and building construction. Such practice is condemned by the industry.

Unfair Discrimination Against Bidders

The following practices of discrimination against invited bidders, extending secret and undue advantage to any one bidder or deceiving any bidder are condemned by the industry:

(a) The inducing or attempting to induce an architect, owner or builder to reveal to any bidder on a competitive job information relative to bids already received, which information would give the favored bidder an advantage in the preparation of his own bid, is condemned by the industry.

(b) To induce or attempt to induce an architect, owner or builder to reveal to a bidder the amounts and conditions of the bids received on a competitive job, with a view of giving the favored concern an opportunity to meet or cut below the lowest bid, whether the favored concern was one of the original bidders or not, is condemned by the industry.

(c) To mislead or deceive any bidder as to the amounts and conditions of other bids, with a view to inducing him to cut his own bid, is hereby condemned by the industry.

(d) A submission of subsequent bids after bids have been received, opened and closed, unless there is a change from the original plans and specifications of 10 per cent or more in the quantities of material or labor, or both, within a period of 30 days, is hereby condemned by the industry.

Terms of Sale

The industry hereby records its approval of the practice of making the terms of sale of electrical products a part of all published price schedules, and the failure on the part of wholesale distributors or manufacturers strictly to adhere to such terms of sale and enforce collection under such shall be termed an unfair trade practice.

Recommended Practices

Requests for Bidders

The industry favors the adoption of the following rules for calling for bids:

(a) In all cases where competitive bids are requested, no one shall be invited to bid to whom the contract would not be willingly awarded in case his bid is the most acceptable in itself.

(b) Where accurate estimates are desired for information only, a reasonable fee or fees shall be paid to the parties preparing them.

(c) Plans and specifications shall be sufficiently complete to enable competent bidders to estimate accurately the amount of material and labor required. Invited bidders, provided they actually submit bids, shall not be required to pay for the use of plans and specifications.

(d) A reasonable time shall be allowed for preparation of estimates. The industry approves a method by which bidders file copies of their bids with a designated depository; the same to be kept sealed and confidential until after the day of closing, or after the letting of the contract, following which they may be disclosed to all bidders.

Closing Date for Bids

In all cases of competitive bidding, a definite closing date should be set. Before the closing date all bids should be held confidential in all of their details; after the closing date, they should all be revealed in full to all of the bidders. The procedure of the United States government in handling competitive bids is recommended for general adoption.

Payments Under Contracts

The prompt making of current partial payments as they fall due under any contract should be of the essence of the contract itself; failure to make them on time should justify the contractor in suspending all work, whether of deliveries of materials or installation of same, or both, until payments are brought up to date; the time involved in any delay due to this cause should be added to the time of completion of the contract, and such delays in payment should further be treated as defaults of the same character as when the contractor fails to comply with the terms of the contract as to time and rate of completion.

Interpretation of Specifications

Where a bidder requests an interpretation of some feature of the specifications by the architect before submitting his bid, which would materially affect the cost of the work, the same information should be submitted to all other bidders by the architect, or those requesting bids.

National Electrical Code

In territories where no governmental laws, rules or regulations as to electrical installations prevail, the regulations as laid down in the National Electrical Code, as approved by the American Standards Association, shall be used.

Reasonable Differentials

Recognizing that the expense of handling, selling and delivering electrical products by wholesalers is appreciably higher for small-quantity than for large-quantity lots and that the failure to apportion to each quantity lot of electrical products its correct proportion of such expense necessarily increases the cost of other sales, the industry hereby records its approval of the principle of a reasonable differential in prices in the several types and characters of sales.

Advocates Electric Welding of Boilers

Photomicrograph of B. & W. weld metal
Magnified 100 times.

Babcock & Wilcox Company bases recommendation on several hundred tests

Declares code should recognize electric welding

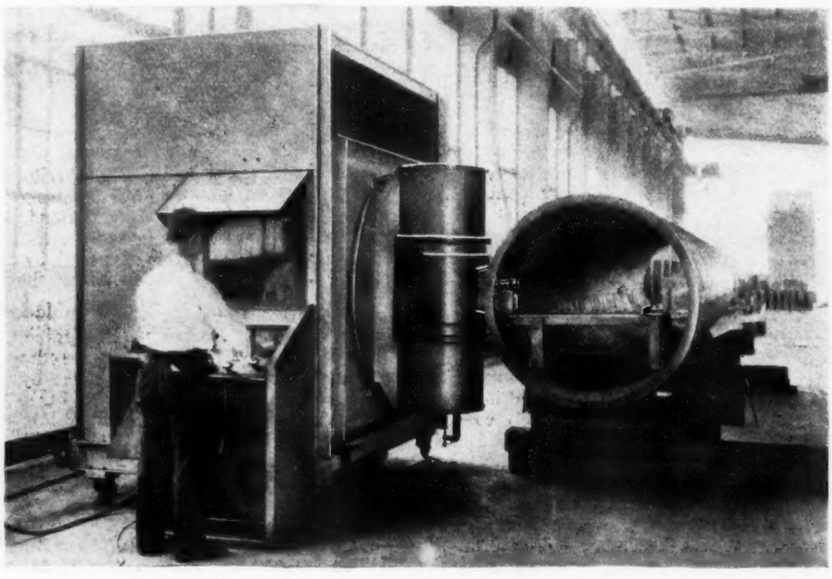
Characteristics of welds determined by X-ray and electromagnetic methods

PUBLICATION by the boiler code committee of the American Society of Mechanical Engineers of proposed specifications for fusion welding of drums or shells of power boilers, with the request that criticisms and comments be submitted, has created much interest in the welding field.

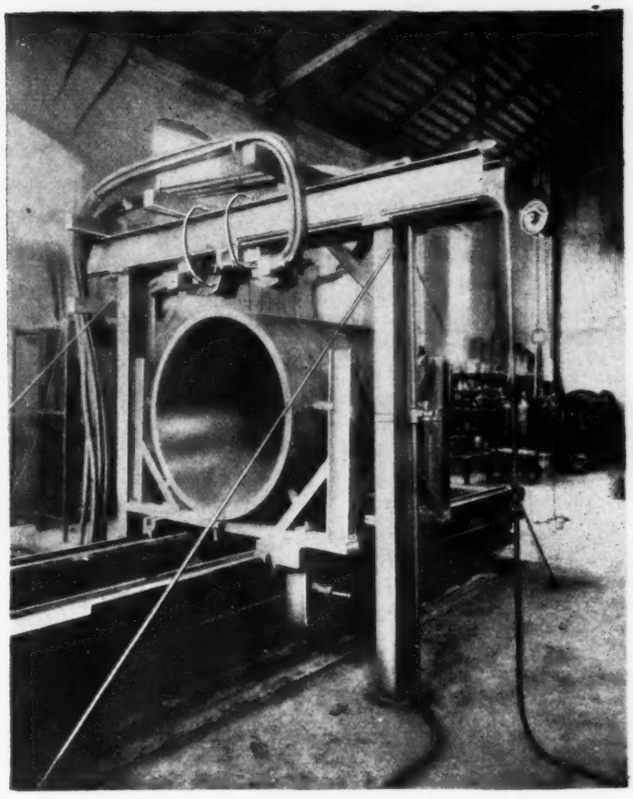
Developments in the welding art have taken two directions—a study of the technique of welding and a study of the technique of testing. Several reliable methods of electric arc welding have been developed and test procedure is now available to determine the quality of a welded structure without the use of destructive tests. Electric welding is an accepted practice for high-pressure, high-temperature applications in the petroleum and chemical industries.

One of the most recent advocates of electric welding for boilers and pressure vessels is the Babcock & Wilcox Company. Research and development have been carried on for several years by this company and have reslted in a welding technique that convinces it that the time is rapidly approaching for code acceptance of welded boilers.

The fusion welding process developed by the company involves the use of a specially coated low carbon steel electrode, special automatic and hand equipment for welding and special test procedure for testing the completed weld. Welds made by the process are equal to or better than the plate metal in tensile strength, shock resistance, ductility and the ability to withstand repeated stresses. The process also lends itself to welding so readily that unskilled welders can be taught to make sound welds in a short time. The characteristics of the B. & W. fusion welding may be outlined, as the result



X-ray test of a welded boiler drum



Sperry electromagnetic method for testing welded boiler drums

of several hundred tests, as shown in the accompanying table.

The essential element of the B. & W. weld is the use of a specially coated low carbon steel electrode that keeps the weld free from nitrides and oxides, and helps fusion. The metal is well wet, slag free and completely fused. The built-up weld is used whereby each bead is annealed by the succeeding one, leaving only the extruded final bead of coarser grain for removal. On heavy plate 2 to 3 in. thick a current density of about 600 amp. is used and from 10 to 12 lb. of weld metal is laid down per hour. Special machinery has been developed for different types of welding operations.

Many tests of all kinds and commercial applications of welded vessels made by the Babcock & Wilcox Company have convinced it of the merit of its weld and welding technique. Vessels have been tested to destruction and have been subjected to millions of pressure cycles to determine the endurance limit. Test pieces have been taken by the hundreds. As a result the engineers are convinced that repetitive welds of uniformly high quality are now a production manufacturing achievement.

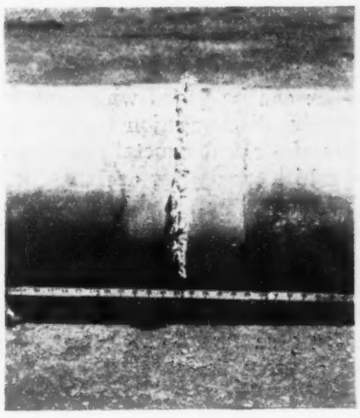
Standard test piece procedure and destructive tests on completed structures are not convenient manufacturing tests. It is desirable that tests be developed for completed structures that do not involve destructive effects and that are practicable to apply to manufactured shapes.

Two non-destructive tests are used by the company. In one test an X-ray photographic plant designed by the St. John X-Ray Service Corporation is used and in the other test an electromagnetic flaw detector equipment is employed which was developed in the B. & W. shops by the Sperry Development Company. Exposures are taken along the weld at intervals of about 12 in. and each exposure requires from $\frac{1}{2}$ to $2\frac{1}{2}$ minutes, depending upon the thickness of the metal. A 2-in. boiler plate will require about two minutes exposure, for example. These X-ray photographs show up slag formations and voids clearly. They would be more complete, however, if taken in two or three planes. Because it is impracticable to make photographs in more than one plane electromagnetic tests are made to complete the data.

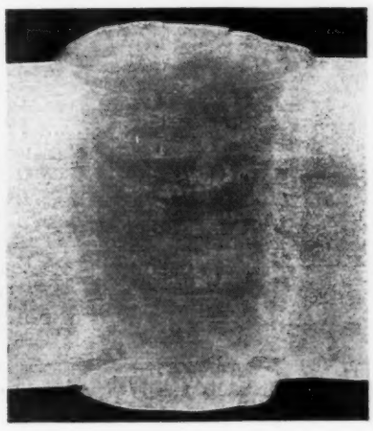
The other test is an application of the Sperry electromagnetic method, wherein recording pens show evidences of changes in permeability. A 2-in. section test specimen, for example, with a $\frac{3}{8}$-in. open hole and a $\frac{3}{8}$-in. plugged hole will show a record for both faults and a magnitude difference in the faults. The electromagnetic method will show up major voids, cracks and slag formations readily and is capable of development to a still higher degree of sensitivity.

It is felt that these two test methods can be made a part of production procedure to check welded manufactured products accurately and conveniently.

For small tubular fabrication the Babcock & Wilcox Company has developed butt welding to a very satisfactory stage. This type of welding is convenient and rapid for many boiler and pressure vessel parts and



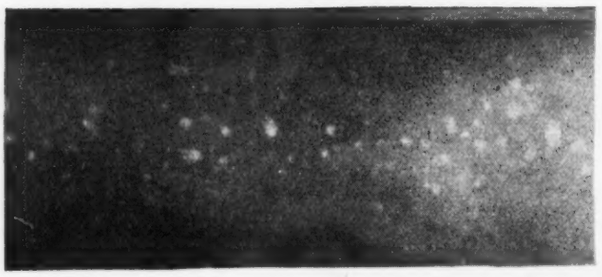
Butt-welded high-pressure tube



Section of 2-in. boiler plate weld

Note successive beads with fine crystals obtained by successive annealing effects as contrasted with exterior beads.

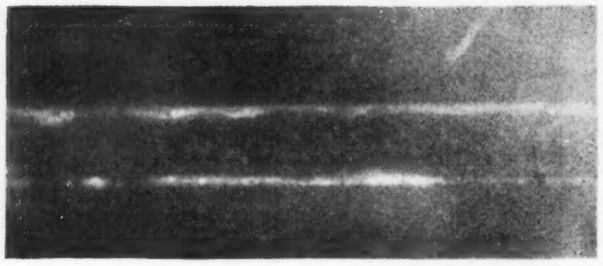
X-ray photography shows character of weld

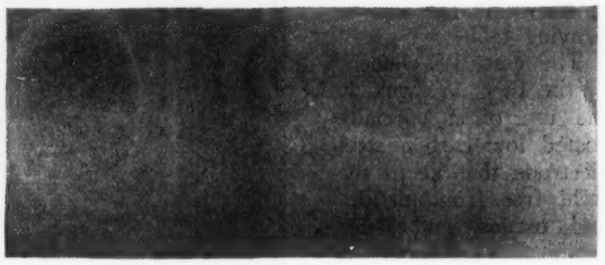


Top — Slag and void effects that may or may not affect weld strength seriously.

Left — Slag and void formation that shows a bad weld.

Right—A perfect weld gives a blank picture.





admirably rounds out the welding needed to produce high-pressure, high-temperature boilers.

The art of welding has advanced to a stage where many engineers in the power industry, as well as those connected with many boiler manufacturing companies, believe that welded boilers should be accepted by the Boiler Code. An encouraging note is found in the advocacy of welded boilers by the Babcock & Wilcox Company as a result of the study and manufacturing development this company has made to produce high-pressure, high-temperature boilers and other pressure vessels. Welding is no longer an empirical art confined to rough fabrication. It is ready for precision manufacturing in the production of the highest class of pressure vessels.

Characteristics of B. & W. Fusion Weld

1. *Tensile Tests:*

Ultimate tensile strength in lb. per sq.in.	Min.	Max.	Ave.
B. & W. weld metal	65,000	74,500	67,500
Boiler plate	55,000	65,000	60,000
Yield point in lb. per sq.in.			
B. & W. weld metal	40,000	55,000	45,000
Boiler plate	.....	.....	½ ultimate

2. *Elongation Tests.* All weld metal specimens:

	Min.	Max.	Ave.
Elongation in 2 in., per cent	20.5	38.0	28.0
Reduction of area, per cent	32.0	65.0	40.00

3. *Bend Tests.* Specimens bent to an inside diameter equal to the thickness of the plate. The outside fibers elongated 30 to 65 per cent with an average of 45 per cent.

4. *Impact Tests.* Resistance to spread of a crack once started. Charpy impact values.

	Min.	Max.	Ave.
A.S.M.E. boiler plate, ft.-lb	19	33	20
B. & W. weld metal, ft.-lb	20	45	28

5. *Chemical Analysis*, per cent:

	B. & W. Weld Metal	Ordinary Arc Weld Metal
Sulphur	Less than 0.04	Less than 0.04
Phosphorus	Less than 0.04	Less than 0.04
Manganese	0.30 to 0.60	Less than 0.20
Carbon	0.08 to 0.15	0.02 to 0.08
Nitrogen	Less than 0.02	0.10 to 0.14

6. *Density.* The specific gravity is as follows:

	Min.	Max.	Ave.	Per Cent Voids
Fire box plate	7.80	7.85	7.85	0 plus
Bare electrode weld metal	7.44	7.68	7.59	3.30
B. & W. weld metal	7.83	7.85	7.84	0.12

▼ ▼ ▼

German Network Problem Solved by 380-Volt Fuses

WHILE realizing the simplicity and great reliability of the alternating-current low-voltage network systems installed in American metropolitan districts, German cities have been slow to adopt the principle because of their higher distribution voltage, according to the *Elektrotechnische Zeitschrift*. Doubts were expressed whether such a system would still be applicable to the 380 phase-to-phase, 220 phase-to neutral voltage now standard in Germany and many other European countries.

Recent extensive tests on a great variety of cables have shown, according to the same publication, that at 420 volts any cable fault involving up to about 10,000 amp. is always self-clearing within a few cycles, but with more than 10,000 amp. the arc is liable to remain.

This led to the development of a high-current fuse which can be gaged with sufficient accuracy to afford a selective disconnection for a heavy fault. The fuse consists of a circular metal ring, from four peripheral points of which zinc wires are stretched toward a central bolt. Surrounded by an effective magnetic blow-out field, very heavy short-circuit currents are interrupted within half a cycle with a minimum of fire. In fact, the arc is blown out so quickly that only parts of the four wires have a chance to evaporate. With fuses of this type guarding against serious faults, closely meshed supply systems with automatic network switches may be readily introduced in the 380-volt supplies of Germany.

THE INVESTOR Wants the Facts*

By Dr. GEO. CLARKE COX

Cox & Jordan, Investment Counsel

MY TASK is to bring before you certain shortcomings of statement, partly inevitable because of the complexity of operations and partly, it has been said, deliberately intended to withhold from the public information for which the public is now making a clear and insistent demand.

Any buyer of securities, who is not buying merely on tips from uninformed and interested outsiders, has a sufficiently formidable task even if income statements and balance sheets are given with the most exemplary frankness. Such investors must not only know how to read the statements given but must be informed about the probable growth of an industry, its cost of capital, its labor problems, the price it must pay for raw material and many other things. Above all else, the quality of the management should be considered. Then such investors must have some fairly correct idea of the condition of the money market, world movements in finance, the export situation, the attitude of the public toward utilities, etc. Of course, these conditions apply to other than gas and electric power companies, but in the present state of agitation are particularly applicable to them.

The proper reading of financial statements is an art in itself. Not one investor in a thousand is equipped to do it. It can be done only by men with very special training. There are, however, tens of thousands of experts constantly studying and interpreting such statements, though by no means always with a desire to help the investor to know the facts.

For many years public utilities, especially, have encouraged and urged the ownership of their securities by employees and customers, and to this extent they are obligated to treat them as partners. Of course, the general public which buys common stocks is theoretically a partner in the enterprise. This partnership is a limited affair and certainly no small individual stockholder is entitled to all the inside information, for he would become a common nuisance. A certain amount of privacy is proper when a great industry is managed by a group of men and they should not be required to tell all the privates in the ranks what is going on at all times. America has not come to the Soviet ideal yet and one may question whether even Soviets in practice do what they preach.

> ***Genuine* investors, by which I mean men who buy the securities of a utility in order to participate in its expected growth, are a strength to that utility and should be treated as friends, not as enemies or hostile critics.**

Now when an annual report is made to stockholders, it is all too frequently made from the point of view of the management and all too seldom with the idea of telling the stockholder-partners precisely what is the status of the company. Apparent frankness is a very good weapon of defense for a management, but if it be only apparent it is a method calculated not only to deceive the ordinary stockholder but also sooner or later to redound to the disadvantage of the management.

Accounting methods more lucid

A few years ago accounting methods hardly touched the stockholder. Whatever the condition inside the organization, reports to the stockholding public were meager in the extreme. However, for many years past in New York State, and for approximately ten years throughout the United States, there have been, as you all here so well know, uniform accounting methods of operating companies. You know far better than I do, although I know it pretty well, that these elaborate, lengthy, detailed methods of accounting, even of operating companies, are so complex that it takes an expert accountant to make anything out of them at all. They would be far more confusing, if given to the general public, than anything which now exists. For the purpose for which they were constructed they may be admirable, although my own opinion is that they might be enormously improved, even so. For the general public, they are of no value.

**From an address before Empire State Gas & Electric Association, Saranac Inn.*

Income Accounts of Three Public Utilities Compared

Eastern Company	**Middle Western Company**	**Pacific Coast Company**
Reports Year End Only	Reports June 30 and Dec. 31	Reports June 30 and Dec. 31
Gross operating revenue	Gross operating revenue including *other income*	Operating *revenues*
Operating expense	Operating and admin. expenses, taxes (incl. fed.), maintenance	Cost of prod., dist., and oper. expenses
Retirement expense Taxes	Bond interest, discount and expenses	Rent of leased plant
Net Earnings:	Reserves for *depreciation*	Retirement expense
Non-operating revenue	Net income	Uncollectible bills
Non-operating rev. deductions	Dividends pd. on pfd.	Taxes
Non-operating income	Common *dividends*	Net operating income, other *income*
Gross Income:	Balance, surplus	Total income
Interest on funded and unfunded debt		Other deductions
Surplus Earnings:		Interest on *funded debt*
Dividends paid on common stock, $5 cum. pfd,, 6% cum. part. pfd. On affiliated company stock		Net income
Balance carried to surplus account.		Dividends
		Balance to surplus

I have in mind one great company which is emphatically an operating company in this great state. Reports of the individual units of this great operating company are not the reports upon which are based calculations as to the value of the stock which is for sale on the New York Stock Exchange. Its manifold parts, all of them operating, all of them closely welded together, show a consolidated balance sheet and a consolidated income statement—the only things possible to give to the public. There is no concealment, so far as I know, about this company. It makes its reports in admirable shape with unusual clarity, and yet it is in all essential respects a holding company.

Variation in reporting policies

I have taken the formal statements of this company, which is on the Atlantic seaboard; one in the Middle West, similar in character, and one on the Pacific Coast, also similar in character, and on a separate sheet. I have in parallel columns presented the headings under which reports are made. I have no reason to believe that there is any manipulation of these accounts in any improper sense. All three of them are operating companies. They are so thought of by the general public, and even to a large extent by public authorities, yet each of the three is in essence a holding company, and although they are similar in character, yet there are so many dissimilarities that these headings are not to be wondered at.

You will note that one of them makes reports only at the year's end. The two others make them semi-annually. More frequent accounting and more uniform accounting even than exists with strictly operating companies is desirable for the investor. Above all else, however, comparable accounting, accounting whereby one can observe not only from year to year but from company to company what has been taking place, is a desideratum.

You who, in many cases, are far more expert accountants than I can ever hope to be, could tell me without difficulty how impossible such accounting is—and I should agree. You will protest that there may be dozens and scores of items, in a complex organization, which cannot be included in any preliminary category. They are non-recurring items. But what about unexplained items fairly "chucked" into an income statement?

First, the accounting, as accounting, might be made more and more perfect according to accounting methods, but the statement of the *meaning* of it all can be put into simple, intelligible terms.

As an example of what I mean, bank statements used to be the most unintelligible of all financial statements. The Corn Exchange Bank in New York, a few years ago, adopted a method of statement which it printed in the newspapers, which was as clear as A B C, and I see no reason why a public utility should not do the same.

The practice of English corporations in permitting a private audit by a stockholders' committee seems to me to hold in it possibilities of great value for American corporations. If utilities were to offer such a thing as this it would be a grand gesture.

No two companies have exactly the same problems and no one company has the same problems in any two years. The larger the company becomes the more is this true. Public authorities may be satisfied by multitudinous details. The general public will be satisfied only with truthful statements wherein the company takes a judicial attitude and not that of an apologist. This is particularly true of income statements. Where extraordinary items occur in what must be counted as income for a particular year, they should be so labeled and explained exactly.

Are holding companies utilities from the point of view of the law? No; from the point of view of the investor, emphatically yes. The public buys their stocks as utilities because they hold utilities. Of course, there are holding companies which hold other things than utilities. In some scandalous cases, it is utterly impossible to separate the value of the stock which is sold to the public as a utility from the stock which may cover all sorts of industrial enterprises.

At present the words "holding company" have a very unpleasant connotation for many people because of the flagrant offenses of some of them. It is an utter impossibility to compare the statistics of different holding companies, and there is a strong suspicion, to put it mildly, that many of them offer stocks which are largely water. This leads to doubt and hesitation on the part of the investor. Practically all the agitation against utilities today is agitation against the holding company—not the operating company. The suspicion that the common stocks of holding companies are largely "water" has done much to breed unrest.

Now "water" is not objectionable in itself provided the public knows that it is paying for water.

Management fees of holding companies are in many cases entirely justified. One holding company which is in my mind (not in the State of New York) has been in existence a great many years. Its management has been a blessing and very large fees would have been warranted.

In other cases, the suspicion that management fees are excessive is well founded and this suspicion is a fatal flaw in the securities of holding companies from the point of view of the investor.

Then there is the suspicion that deals are made between controlling partners in corporations about to be combined, whereby extravagant prices are paid for properties. This charge has been made to me personally by men of the highest reputation in the power field. The many glories of consolidations which caused utility stocks to soar in 1929 were based upon—what?

Since the law at present does not treat companies holding public utilities as public utilities proper, and cannot so treat them and possibly may never be able to treat them as such (on account of their overlapping state boundaries), the duty of such holding companies to give full information without compulsion is all the more plain. So long as information is withheld, suspicion will attach to holding companies.

Criticism of these companies comes chiefly from two sources, viz., politicians—honest and dishonest—and from certain economists. Take the economists first. One of their main contentions is that, while expendi-

tures of operating companies are rigorously overseen by public service commissions and must be for value, the expenditures for holding companies may be merely for control or, far worse, for "control of control."

Moreover, the practice of having holding company piled upon holding company so that one has to go down through several layers to find anything which is actually rendering a public service upon which proper payment can be estimated has led to the suspicion that something is being hidden in this apparently unnecessary process.

Now I know of cases where this process is perfectly legitimate and almost inevitable. In other cases, it is my belief that the multiplication of holding companies is simply to keep the public from knowing what is going on.

Public utilities cannot be privately conducted. There is here a contradiction in terms. It is not necessary to say what the public is entitled to know. Rate questions are primarily a question for the consumer. They are here involved only because of their influence on earnings. The investor, *per se*, is not interested to know whether the rates are just, but only whether they can be maintained. The investor as a private citizen may be interested in the rate which he pays for light in his house or gas in his range, but as an investor he is interested only in the effect of these rates upon the value of the securities which he purchases. In this sense he is interested in the cost of plants on which the rate is based, and he is entitled to know.

Governor Roosevelt's viewpoint

Having this address in mind, I wrote on August 5 to Governor Roosevelt asking him what he, as Governor, would like to know about power companies in New York State. The Governor was gracious enough to send me a lengthy and detailed reply, too long for me to quote here, but it may be summarized as follows:

Governor Roosevelt raises questions about the difficulty of analyzing the statements of power companies so as to tell whether rates are just or not. He points out that in order to estimate proper rates a cumbersome and expensive process must be pursued.

He asks for cost accounting systems of utilities so clearly presented that the cost of operations in various localities may be determined and that there shall be such analyses of costs as to permit allocation of cost to different classes of consumers.

The Governor's requests apply particularly to rate questions and valuations, but, as noted before, these have a direct bearing on the investor's problem. When the executive states that "the statistical and operating data for various localities should . . . be segregated so that the character and extent of the service afforded can be correlated with the cost of furnishing it," there is no direct application to the investor's problem, but it furnishes "atmosphere" which is important.

Now the investor, as such, may be on the side of the Governor or on the side of the utilities. In either case, like the Japanese schoolboy, he "asks to know." If the utilities are able to reply to these questions and criticisms the investor would like to see utilities answer them in such a fashion as to lay to rest for all time the suspicion that he, the investor, is being bamboozled. The mere suspicion has a depressing effect upon the value of his securities.

In this connection large public use has been made of comparison between the Ontario Hydro-Electric system, owned by the province, and the workings of power companies across the border in New York State owned and operated by private interests. Ambassador Sackett said in Berlin some time ago certain things about the exaggerated cost to the consumer of power which was produced at the source very cheaply. His statement has been used with great skill by the enemies of utilities. Certain replies to this have been admirable so far as they go. They should go further.

If the power companies in New York State and elsewhere are able to refute these accusations to their own satisfaction and to the satisfaction of the investor, then it is their duty to see that the answer is given in such fashion that it will carry over to the public. If Mr. Sackett has been talking utter foolishness, then he must be made to seem utterly foolish to the public.

Propaganda means "putting over" ideas which one holds strongly or positions which one "backs," often without much regard to truth or honesty. The American public has been treated to entirely too much propaganda, whether from corporations or from politicians. Whoever may be fooled by this, the investor is not going to be fooled much longer.

It might be a good thing for gas and electric power companies if they were to find some Judge Landis or Will Hays to correlate and criticise their own activities as they relate to the public rather than risk outside hostile interference and regulation.

There is something to fear from scoundrels—not very much. There is something to fear from theorists and advocates of public ownership, but this latter is a fair challenge of which utilities ought not to be in the least afraid. Secrecy and the obfuscation of statement will not be tolerated by the investor. The investor is no foe of utilities or of private ownership. He is a foe only of what threatens his savings or his possible earnings. He is not ill-intentioned, but he is going to get the facts.

Not only has the investor the right of a partner to facts regarding properties of which he is a partial owner, and to that more ordinary information which insiders have and which information the insiders are sometimes accused of having used to their own profit in the stock market, but the investor has become in the modern days of a common-stock-holding public a great natural force.

It is not so much a question whether the public *ought* to be given information—the public *will* get it. Those corporations which have nothing to conceal can face this situation with equanimity. Many of them are doing so. Many of them invite scrutiny from any quarter—public or private—provided it is not the nuisance kind or the blackmail kind. Those utilities which have something to conceal and which are guilty of padding or falsifying returns may as well set their house in order, because the whole population nowadays invests in, or at least buys, public utility stocks;

and the investor is the Nemesis of secrecy.

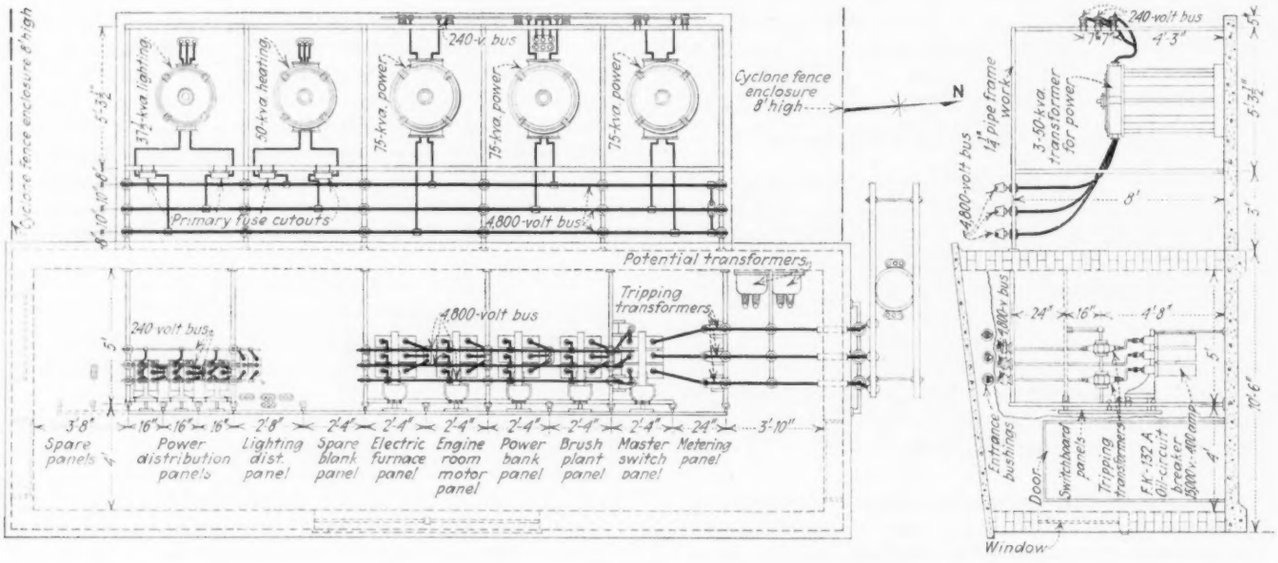
Saving by Modernization

By H. L. ZIEGENBEIN

Industrial Engineer Consumers Power Company, Saginaw, Mich.

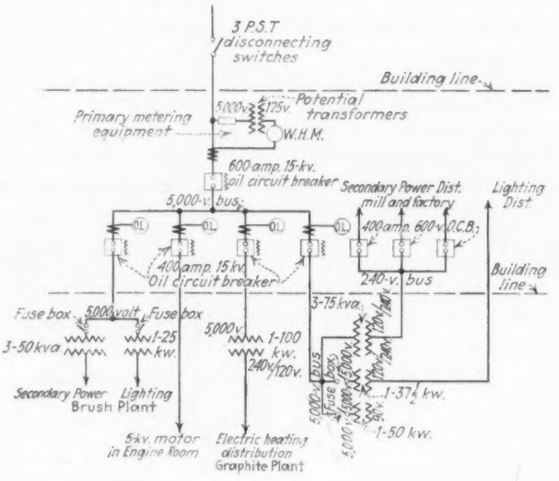
SERVICE in a graphite mill imposes hard duty on electric motors, particularly in the milling rooms, where it is almost impossible to keep the finely divided dust out of the windings. The United States Graphite Company had tried to use individual drives on its mills, but motor maintenance cost was so high and trouble occurred so frequently that the company for years adhered to the group drive with a single prime mover, a cross-compound Corliss engine, 24 in. x 40 in. x 48 in., of 1,000 hp. Other drives in the plant, located out of the graphite dust atmosphere, were electric, the energy being furnished by the Consumers Power Company. But the directly applied steam power was expensive, and when the utility representative showed an estimated saving of 30 per cent for mill drive power and an accompanying reduction of 20 per cent in cost of the other power, the combination of the two cutting the total power cost to three-quarters of its previous amount, through the substitution of a synchronous motor for the steam engine, it was decided to make the change.

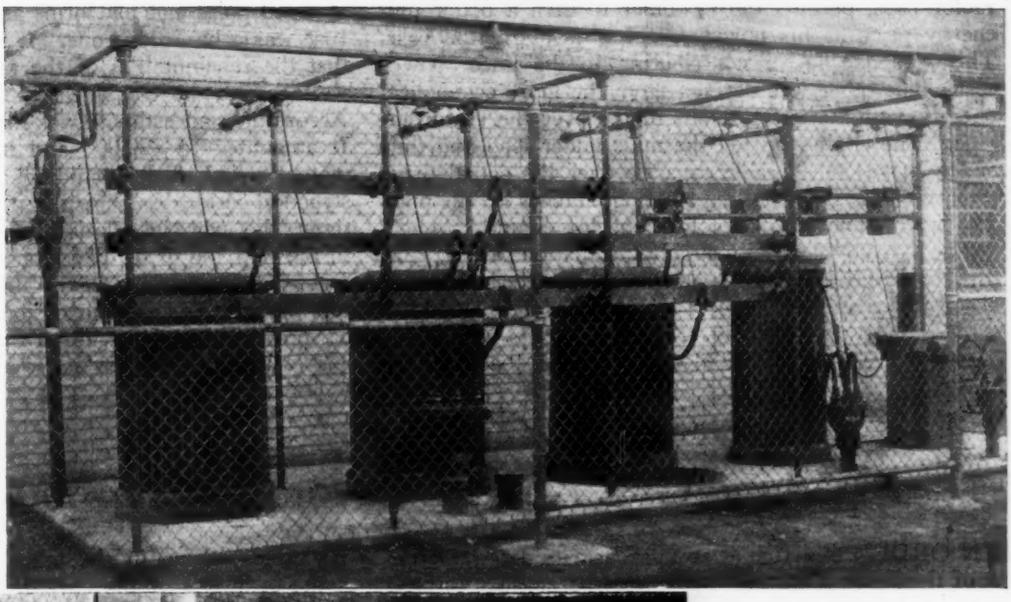
The 500-hp., 4,800-volt synchronous motor, which is belted to the line shaft, as was the steam engine, has raised the over-all plant power factor from 70 to 98 per



Plan, section and diagram of primary service

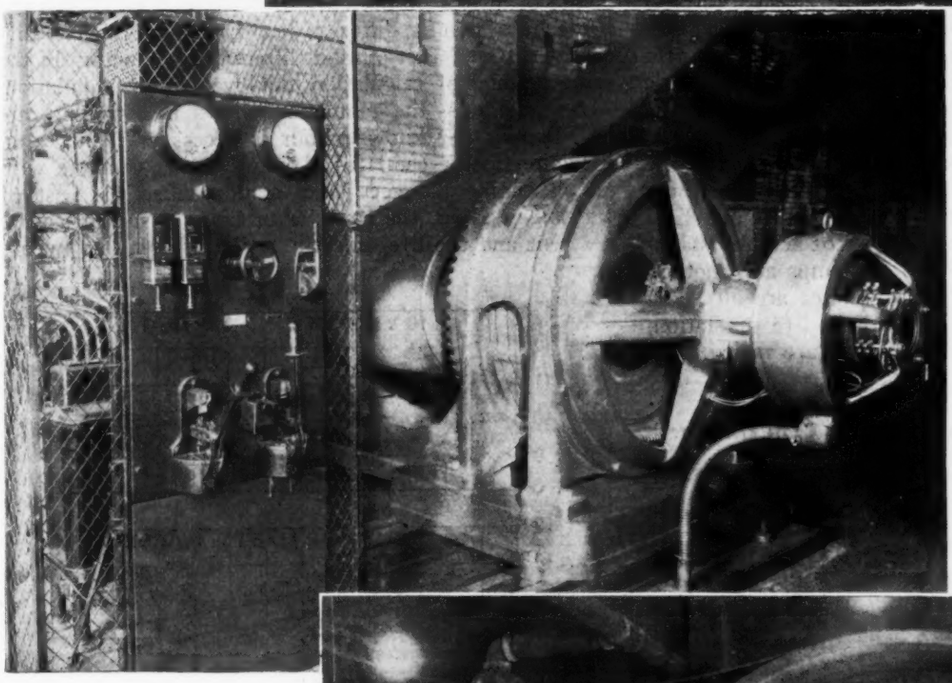
In the switch house is located the primary metering equipment with a master breaker and four high-voltage breakers for distribution. One breaker takes care of the 500-hp., 4,800-volt motor in the engine room; the next controls a bank of three 50-kva. transformers that furnish power to the "brush department," located a considerable distance from the switch house; the third breaker serves a 150-kw. transformer that takes care of an industrial heating load, and the fourth serves as a master breaker to a bank of three 75-kva. transformers for power, one 37½-kw. transformer for lighting and one 50-kw. transformer for additional industrial heating. All the latter transformers are located outside of the switch house and are surrounded by a cyclone fence. Besides the high-voltage breakers, there are four lower voltage breakers for power distribution of the three 75-kva. transformers and a lighting panel to take care of lighting distribution.



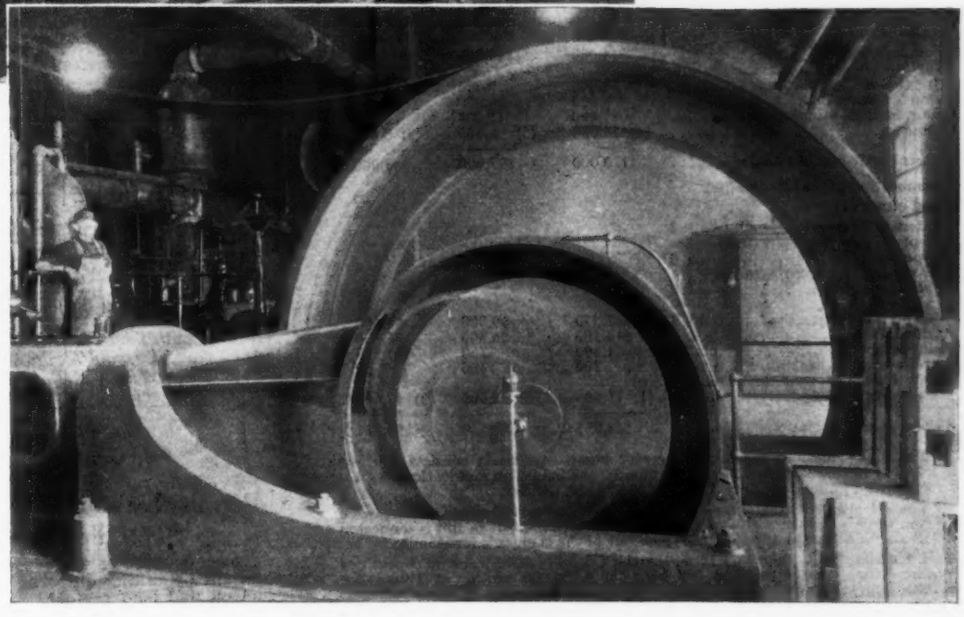


The new primary installation

The workmanlike job replaces an old wooden structure that caught fire whenever trouble occurred and menaced linemen by its decrepitude.



cent. The service previously furnished by the utility was billed on a kilowatt demand and the particular rate schedule applying did not, naturally, result in a unit power cost as low as could be obtained by a larger load and a better power factor. Since the change the Graphite company has been able to take advantage of a kilovolt - amperage demand rate offered by the utility. This rate, which is erected on an 80 per cent power



The economy of the modern drive

The 1,000-hp. cross-compound Corliss was replaced by the 500-hp., 4,800-volt synchronous motor. By raising the power factor the motor effected a saving of 20 per cent in power cost for other loads in the plant. It reduced the cost of its own drive by 30 per cent. The total power cost decrease is about 26 per cent.

factor base, permits the customer to earn a better unit energy price as his power factor goes above the base. This was one factor contributing to the lower power cost. The other was derived from the more economical operation of the synchronous motor over the steam engine. The engine started the mills under load and thus had to have considerable capacity over the actual drive requirement. By installing starting clutches on the mills 500 hp. of motor replaces 1,000 hp. of engine.

The existing electricity supply installation to the plant, through additions, changes and the usual deterioration of obsolescence and service of a long term of years, had become a danger to life and property. When trouble occurred a fire usually started somewhere in the structure of wood poles and platforms and the job of replacing a fuse was a hazardous one. It was suggested, therefore, that the rehabilitation of the primary supply might advantageously be combined with the motor installation. Accordingly an estimate was made for the complete job. It amounted to $20,000 and included the synchronous motor, switch house building and equipment and construction costs. As shown by the accompanying illustrations, the new installation provides 4,800-volt service to the new motor, to 375 kva. of other plant power, to 200 kva. of electric industrial heating and to plant lighting, includes adequate provision for metering and service protection and permits a man to walk up and look at it without taking his life in his hands.

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Pipe Line Cost Analysis Favors Synchronous Motors

IN ORDER to arrive at an approximate determination of the limiting unit electricity cost permissible to meet competition with oil engines for pipe line pumping stations the accompanying tabulation and graph were prepared by W. H. Steuve of the Oklahoma Gas & Electric Company and presented by him in a recent report to the Commercial Section, Southwestern Division, N.E.L.A.

The values set forth in the tabulation and used in the construction of the graph are hypothetical, but were arrived at through Mr. Steuve's experience in this field and the study of the costs in a number of actual installations. The fuel rate, efficiencies of pumps and motors, and the lubricating and cylinder oil rates are all taken from actual data. The factors such as life of station, value of fuel oil and monthly load factor are varied from the values shown in the tabulation in order to arrive at the ordinates of the curves. The various curves are made by assuming different lengths of station life, different costs of fuel oil and different load factors in the same method of calculation employed in the tabulation.

As it stands, the tabulation shows that a unit rate of 7.9 mills per kilowatt-hour is necessary to make an induction motor centrifugal pump station compete with an oil engine plunger pump station when the cost of fuel oil is $1.50, the load factor being assumed as 100 per cent and the life of each station taken to be twenty years.

Installation Costs and Annual Operating Charges for Pipe Line Pumping Stations

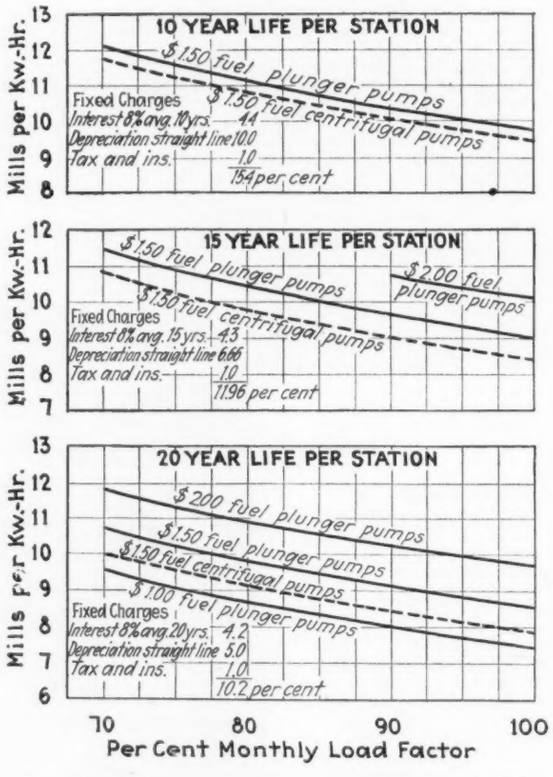
Pumping McCamey Texas crude through 40 miles of level 10-in. line. Average 36,500 bbl. per day at approximately 17.5 lb. per mile.

Installation		Oil Engines to Plunger Pumps	Synchronous Motors to Plunger Pumps	Induction Motors to Centrifugal Pumps
*Pumps installed		$44,000	$44,000	$15,000
†Engines or motors, installation, freight, etc.		70,000	9,000	9,000
Pump house, tanks		30,000	26,000	10,000
Labor, fittings, foundations		12,000	12,000	5,000
Cottages		(4) 14,000	(5) 6,000	(5) 6,000
Total unit station costs		$170,000	$97,000	$45,000
Annual operation (20-year life)				
Fixed charges:				
Interest (average), per cent	4.2			
Depreciation (straight line), per cent	5.0			
Taxes and insurance (straight line), per cent	1.0			
Total, per cent	10.2	$17,350	$9,900	$4,600
Station labor		$14,100	$6,300	$6,300
Maintenance		1,500	750	525
Supplies—waste, packing, etc.		300	100	50
Power (100 per cent load factor) (lubrication, etc.)		(1) 11,585	(2) 32,500	(3) 42,400
Total annual operation		$44,835	$49,550	$53,875

* The oil engine and synchronous motor pump equipment consists of three 5¼ x 24-in., 40-r.p.m. triple d.a. plunger pumps; the induction motor, three 6 x 15-in. centrifugal pumps, capacity 32,000 to 40,000 bbl. per day.

† The oil engines were three 250-hp. Diesels; the synchronous motors were 250-hp., three in number; with centrifugal pumps each four-stage unit is connected to 350-hp. induction motors. In each case one of the engines is for standby.

(1) Fuel oil, 7,150 bbl. at $1.50 per barrel; (2) 3,240,000 kw.-hr. at 1 cent per kilowatt-hour, average demand 370 kw.; (3) 4,230,000 kw.-hr. at 1 cent per kilowatt-hour, average demand 484 kw.; (4) seven cottages; (5) three cottages.



Permissible unit rate per kilowatt-hour for pipe line pumping

These curves are developed from the accompanying tabulations by taking different values for station life, cost of fuel oil and load factors.

Selecting D.C. Motors for Rapid Acceleration

By R. M. KENAH
General Engineer Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

IN APPLYING electric motors, it is often the requirement of rapid acceleration, rather than the free running load, which determines the size of motor required. These conditions are especially numerous in steel mills on such drives as reversing mill tables, screwdowns, manipulators, shears, reels and on machine tools such as planers, automatic punches, etc.

The choice of the proper type of motor, whether series, shunt or compound wound, will often be determined by requirements other than that of rapid acceleration. Mill type motors, either series wound or compound wound with heavy series fields, are usually used on roll tables, screwdowns, manipulators, etc., where the inherent characteristics of increasing speed with decreasing load are desirable. As regards acceleration, they have the advantage in that the starting torque for the same current is better than that of a shunt motor. Where a constant or adjustable running speed is desired or where accurate stopping by means of a limit switch is necessary a shunt motor should be used. A shunt motor will exert a good starting torque, but at the expense of a somewhat greater current.

In the past there has been a tendency to apply compound-wound industrial type motors, having light series fields with 10 to 15 per cent compounding, on the assumption that the starting torque is much higher than that of a shunt motor. This may have been the case with the old style, large air gap motors, but with modern motors the iron is worked fairly well up on the saturation curve, so that there is but little better starting torque on a compound motor than on a shunt motor.

How to compute motor size

Let us now consider the calculation of the size of motor required to accelerate a given inertia load in a given time. Due to the influence of the motor inertia it is impossible to calculate first the load and then select a motor, as can be done when the load is constant. Instead, it is necessary to select a motor tentatively and then calculate the performance of the drive with the motor selected.

In order to make the problem more definite, we will assume that it is required to specify a motor to drive a rod reel shown in the accompanying diagram. This reel consists essentially of a steel disk 32 in. in diameter and weighing 1,200 lb. On one face are mounted twelve steel pins, each weighing 10 lb. and uniformly spaced on a circle of 15-in. radius. The rod enters between the pins with the reel stationary. The reel must then be accelerated in 1½ seconds to 100 r.p.m., corresponding to a rod speed of 785 ft. per minute. It may be seen that the motor must supply power for coiling the rod and also for accelerating the reel in the time specified.

From tests made on a similar reel it was found that the load when reeling rod at 100 r.p.m. was 7.5 hp.

The following procedure may be followed in determining the proper motor to apply:

1. Select tentatively a motor having a horsepower rating somewhat greater than the normal or free running load.

It will usually be found that a rather slow-speed motor will have less inertia effect than a high-speed motor and will have the additional advantage that a lower ratio gear reduction may be used.

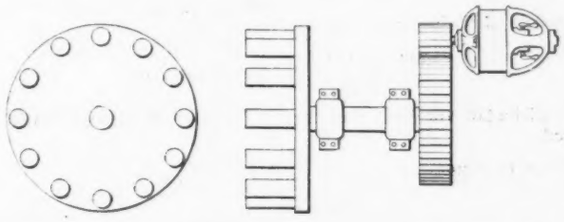
In this case let us select a 15-hp. shunt-wound motor having a full load speed of 400 r.p.m. A shunt-wound motor is used rather than a series or compound wound motor as the reel is required to come up to a definite speed.

2. Calculate the gear ratio required.

$$\text{Gear Ratio} = \frac{\text{R.p.m. of the motor}}{\text{R.p.m. of the reel}} = 400/100 = 4/1$$

3. Calculate the total WR^2 of the moving parts all referred to the motor speed.

The term WR^2 is known as the "flywheel effect" and is numerically equal to the product of the weight of the moving parts in



15 hp. motor required to accelerate this 32-in. rod reel to 100 r.p.m. in one second

pounds (W) and the square of the radius of gyration in feet, (R^2). The WR^2 of each moving part can be calculated and the total WR^2 of the machine determined. The WR^2 of all parts rotating at the same speed may be added directly, but for a machine consisting of parts rotating at different speeds the values of WR^2 must be reduced to a common basis before they can be added. To do this the value of WR^2 is divided by the square of the gear ratio if referring to a lower speed shaft, or multiplied by the square of the gear ratio if referring to a higher speed shaft. This will be more clearly understood by calculating the WR^2 of the reel.

The radius of gyration (R) of a disk of uniform thickness, about an axis through its center is equal to 0.707 R_o, where R_o is the outside radius. The WR^2 of the disk forming a part of the reel is then

$$1{,}200 \left(0.707 \times \frac{16}{12}\right)^2 = 1{,}070 \text{ pound-feet square.}$$

The weight of the pins may be assumed as concentrated on a radius of 15 in., so that the WR^2 of the twelve pins will be:

$$12 \times 10 \times \left(\frac{15}{12}\right)^2 = 187 \text{ pound-feet square.}$$

Similarly the WR^2 of the gear on the reel shaft was found to be equal to 75 pound-feet square. The WR^2 of the shaft is small and may be neglected.

The total WR^2 of the reel is then:

$$1{,}070 + 187 + 75 = 1{,}332 \text{ pound-feet square.}$$

As the gear ratio is 4/1 the WR^2 referred to the motor speed will be:

$$\frac{1{,}332}{(4)^2} = 83.3 \text{ pound-feet square.}$$

We must now add the WR^2 of the motor armature. These values are sometimes given on the motor rating sheets, but may in any case be obtained from the manufacturer. The motor which we have selected is found to have a WR^2 of 30 pound-feet square and the motor pinion 4 pound-feet square. The total WR^2 referred to the motor shaft is then:

$$83.3 + 30 + 4 = 117.3 \text{ pound-feet square.}$$

4. Determine the average motor torque during the acceleration period.

The current, and hence torque, during acceleration varies from the peak value, limited by the starting resistance, to the minimum, determined by the setting of the accelerating relays. An industrial type shunt motor may, however, be counted on to handle current peaks of at least 150 per cent of full-load current during the acceleration period. Assuming that the minimum value is 100 per cent of full-load current, the average value will be 125

per cent and the average torque during acceleration will be 125 per cent of full-load torque.

The full-load torque of the motor which we have assumed is found,

$$\frac{\text{Hp.} \times 5{,}250}{\text{Motor R.p.m.}} = \frac{15 \times 5{,}250}{400} = 197 \text{ pound-feet.}$$

The average torque during acceleration will then be:

$$1.25 \times 197 = 246 \text{ pound-feet.}$$

5. Calculate the net motor torque available for acceleration.

This is obviously the torque which the motor can avert minus the torque necessary for coiling the rod. The load when coiling rod at full speed was found to be 7.5 hp.; the corresponding motor torque will then be:

$$\frac{\text{Hp.} \times 5{,}250}{\text{R.p.m.}} = \frac{7.5 \times 5{,}250}{400} = 98.5 \text{ pound-feet.}$$

The net motor torque will be:

$$246 - 98.5 = 147.5 \text{ pound-feet.}$$

6. Calculate the rate of acceleration of the motor.

$$\text{Acceleration in r.p.m./sec.} = \frac{308 \times \text{Torque}}{WR^2}$$

$$\frac{308 \times 147.5}{117.3} = 388 \text{ R.p.m./sec.}$$

7. Calculate the time necessary for the motor to come up to full speed.

$$\text{Time in seconds} = \frac{\text{Motor r.p.m.}}{\text{Acceleration in r.p.m./sec.}}$$

$$\frac{400}{388} = 1.03 \text{ seconds.}$$

This motor will accelerate the load in a little over a second and should be satisfactory. If the time found above had been longer than 1½ seconds it would have been necessary in this case to assume a larger motor and repeat the calculations.

This method of calculation applies to shunt-wound motors and is also approximately correct for compound-wound motors having light series fields.

The Road to Deficits

GOVERNMENT ownership is nothing more than the substitution of government deficits for private profits. It is the inoculation of the dynamic energy of private enterprise with the palsy of politics. It is the indolent offspring of loafing minds and loitering ambitions and its ancestry may be traced through a long line of dawdling political soothsayers.

Government ownership has never won an industrial battle despite the unfair advantages it demands in its own behalf. It has never developed a new idea and it has never created anything except jobs. Its whole tendency is to make politics instead of business the national dividend producer. Its chief objective is to transform the state into a benevolent Santa Claus doing everything for everybody at no cost to anybody. It may indeed be designated as the Santa Claus idea of government, the coming of which is loudly heralded by political sleigh-bell ringers.

HENRY SWIFT IVES,
Special Counsel Association of Casualty and Surety Executives.

Electric Repair Shops Relieve Maintenance Worries

SMALL industrial plants which contemplate increased use of electric power cannot always afford an expert electrical maintenance man or keep spare motors or motor parts on hand to avoid long and costly shutdowns for repairs. Among these small manufacturing concerns there have been some that have been reluctant to commit themselves to exclusive electric service or take full advantage of its possibilities. The maintenance problem looms large in their hesitation. However, electrical repair shops which have men trained and experienced in maintenance work are to be found in nearly all localities of any industrial importance. These companies are equipped to render quick service within a radius of 50 or more miles, not only for repair work but for advice in many phases of electric utilization. Electrical maintenance in the small plant no longer means dependence upon the personnel of the user.

Some repair shops carry spare motors in various sizes up to about 200 hp. for loan to their customers to replace motors under repair. Often no charge is made for the actual rental of these machines; merely a service charge is made to cover the cost of cleaning them and restoring them to their original condition. In cases where a spare motor of the desired speed or horsepower is not available a larger motor with different pulleys to compensate for the change in speed of drive may be installed and production can continue, though the drive may not be fully as satisfactory as that of the original motor. A stock of portable tools for removing and installing equipment and fast motor trucks make expeditious service possible to points at a distance from the shops. These shops also give customers the advantage of their expert advice on subsequent maintenance.

Most motor failures are the results of excessive overloading, single-phasing or rubbing of the rotor on the stator because of worn bearings. Minor repairs can often be made satisfactorily, but in cases where a motor has been running under excessive load it is better to rewind it than to attempt to patch the old winding. Usually it is found that the insulation has become so brittle that it is impossible to make a good repair job by patching. Motor rewinding costs from 50 per cent of new-motor cost in very small motors to 25 per cent of new-motor cost in large motors.

Industrial plants which are of sufficient size to afford an investment in spare stock will find that a few stator coils and bearing linings kept on hand for replacements in case of motor failure will often eliminate the long and costly shutdowns for repairs.

One particular instance is cited by George Stratton of the Armature Winding Company, Charlotte, N. C. The plant had motors totaling 2,000 hp., and carried nine sets of spare stator coils for its 2,300-volt motors, a precaution which represented an investment of only $1,000. Recently a 100-hp. motor in this plant was burned out by lightning and production was stalled, but the motor was rewound, connected and put back into service again in only fourteen hours. A sizable part of the wise investment was recovered by eliminating a much longer period of interrupted production.

Men of the Industry

International General Electric Makes New Appointments

THE resignation of William A. Reece as president and managing director of the General Electric, S. A., of Argentina to become the managing director of the Anglo-Argentine Electricidade has been announced by Walter J. Edmonds, vice-president of the International General Electric Company. Anglo-Argentine Electricidade consists of a large group of public utility properties in the Argentine in which the American & Foreign Power Company has a substantial financial interest. Mr. Reece became managing director for the Cia General Electric Sudamerica in 1915 and in 1926, when the General Electric, S. A., took over the Argentine business, Mr. Reece was made president and managing director of the newly formed organization.

Charles Clark Batchelder succeeds Mr. Reece in the General Electric, S. A., of Argentina organization, being appointed vice-president and general manager and chairman of the executive committee. In 1916 Mr. Batchelder went to the Argentine for the General Electric Company and ten years later, when General Electric, S.A., was formed, he was made chief engineer and a director.

Heman Greenwood has been appointed as vice-president of the International General Electric Company, Inc., with headquarters in Rio de Janeiro, Brazil, in charge of the company's interests in Brazil and the Argentine. He joined the General Electric foreign branch in 1925, when he was made vice-president and general manager of General Electric, S.A., of Brazil. He had formerly been associated with the Pelton Water Wheel Company in Brazil. Previously he had spent some time in China.

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DR. VLADIMIR KARAPETOFF, professor of electrical engineering, Cornell University, has been appointed visiting professor at the Polytechnic Institute of Brooklyn. Dr. Karapetoff will conduct a seminar in contemporary advances in electrical engineering. This study embraces a review of the theory, construction and application of various groups of electrical machinery, the modern trend of development and the principal problems in the design, manufacture and operation of major types of electrical apparatus as well as the analysis of recent literature on controversial points in electrical engineering and the prediction of probable paths of future development. He will also give a course in electric waves, a study of the physical characteristics of waves traveling along parallel conductors, and the transmission and reflection of energy at junctions and line terminals.

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L. A. JONES has resigned as vice-president and purchasing agent of the New York Power & Light Corporation to become purchasing agent of the General Cable Corporation with headquarters at the offices of that company in New York City.

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Messrs. Frost and Trott New Vice-Presidents in Los Angeles

W. L. FROST, general commercial manager of the Southern California Edison Company, Ltd., and D. M. Trott, comptroller, have been elected vice-presidents of the company to head the sales and finance divisions, respectively. Mr. Frost's career with the company began as a groundman, at Pasadena, Calif., in 1900. He later was made agent at Redondo Beach and in 1906 became agent, or district manager, in Santa Ana. Two years later he was transferred to the Redlands office in the same capacity and in 1916 was appointed assistant general agent in the Los Angeles general offices. He was made assistant to the vice-president in 1920, holding that office until his appointment as general commercial manager in 1926. Mr. Frost has been active in the affairs of the Pacific Coast Electrical Association for a number of years, being a past-president of that organization.

W. L. Frost

Mr. Trott has been a member of the company 25 years, entering the service as an accountant in 1905. He became a traveling auditor two years later and in 1912 became statistician. He was appointed assistant comptroller in 1917, advancing to the office of comptroller in 1920. B. F. FLUNO, who succeeds Mr. Trott as comptroller, has been assistant comptroller of the company since February 1, 1924. He entered the company's organization in 1914 and two years later was appointed statistician.

D. M. Trott

BYRON T. STORY has been appointed treasurer of the Southern California Edison Company following an association with the company and its predecessors which covers a period of 27 years.

CARL W. BERGQUIST, superintendent of public relations for the Western Electric Company at Chicago, has been named president of the National Safety Council. Mr. Bergquist has had a 35-year record with the Western Electric Company, during which time he has held various executive positions in that organization. He has long been identified with civic affairs in Chicago, having been active in most of the leading civic and philanthropic organizations in that city. For many years Mr. Bergquist has devoted special attention to safety work.

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ALMON D. PAGE has retired from the Edison Lamp Works of the General Electric Company after an association that covers a period of 40 years. He started his business career with the United Edison Company in New York City in 1889 and went with the Edison Lamp Works at Harrison, N. J., in 1890 as assistant factory manager and manager of sales. He resigned his former position in 1892, but continued as manager of sales until September 1, 1925, when he resigned to become a member of the advisory committee.

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H. W. HOUGH has been appointed associate general manager of the Cleveland Electric Illuminating Company to succeed C. L. Stone, resigned. Mr. Hough has been connected with the Cleveland utility for twenty years. He was identified with the Consolidated Gas, Electric Light & Power Company of Baltimore for five years and then with the Norfolk & Southern Railway Company for three years before joining the Cleveland utility in 1910. He first engaged in research work and in 1923 he became assistant to the president.

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DR. ADDAMS S. MCALLISTER has been appointed assistant director in charge of commercial standardization at the National Bureau of Standards, according to an announcement made by Dr. George K. Burgess, director of the bureau. For several years Dr. McAllister specialized in physics and electrical engineering. For seven years he was associate editor and for three years editor of the ELECTRICAL WORLD, and during the war served on many advisory boards and committees. He was closely associated with the organization and early work of the American Engineering Standards Committee, now the American Standard Association. In 1921 he became electrical engineer at the National Bureau of Standards, but soon was placed in charge of the bureau's specification work. Upon the organization of this work into a separate division on July 1, 1929, Dr. McAllister was chosen as its chief. In this capacity Dr. McAllister has come in contact with practically every technical and trade association in this country, with all the state purchasing agents, and with many other national and state officials. The appointment of Dr. McAllister fills a vacancy created by the resignation of R. M. Hudson last December.

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M. E. Skinner in Buffalo

M. E. SKINNER, chairman of the merchandising committee, Niagara Hudson Power Corporation, moved his offices this week from Albany to Buffalo, where he will continue as head of the committee with its state-wide activities in merchandising promotion for the Niagara Hudson system. Mr. Skinner joined the Mohawk Hudson Power Corporation at Albany as commercial manager in May, 1927, and in October, 1927, was appointed vice-president and commercial manager of the New York Power & Light Corporation. Both companies are now subsidiaries of Niagara Hudson. He went to Albany from the Duquesne Light Company, Pittsburgh, Pa., of which he was commercial manager.

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R. C. GEPPERT, who was formerly assistant general superintendent of the Nebraska Power Company, has been named general superintendent. Mr. Geppert has direct supervision of merchandise, transportation, accident prevention and claim departments. He is also in charge of the Council Bluffs operations of the Citizens Power & Light Company. Mr. Geppert made his first connection with the Nebraska company in 1919, after a connection with the Pacific Gas & Electric Company of San Francisco. He is a graduate of Leland Stanford University of Palo Alto, Calif. Mr. Geppert is chairman of the accident prevention committee of the Middle West division of the National Electric Light Association.

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LEONARD WHISTLER, auditor of the central division of the Niagara Hudson Power Corporation, has been made treasurer and assistant secretary of the Syracuse Lighting Company, Inc. He has been engaged in public utility accounting since 1904, when he joined the Canadian Niagara Power Company. He was later transferred to the Niagara Falls Power Company. In 1917 he entered the services of the Northern New York Utilities and then assumed charge of accounting for the Northeastern Power Corporation. He is treasurer and a director of the Cortland County Traction Company.

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C. L. STONE, associate general manager of the Cleveland Electric Illuminating Company for the past nine years, has resigned. Mr. Stone has been affiliated with the electrical industry for 32 years. His connections include the General Electric Company, the Manila Electric Railroad & Lighting Company in the Philippine Islands and the Southern New York Power & Railway Corporation.

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E. OGDEN KETTING, formerly managing director of Insull, Son & Company, Ltd., of London, has been elected deputy chairman of the company to succeed the Right Hon. Lord Churston, M. V. O., O. B. E., deceased. This selection makes Mr. Ketting the ranking officer of the company abroad, as the chairman is Samuel Insull. Mr. Ketting was formerly assistant secretary of the Commonwealth Edison Company and for several years was secretary to Mr. Insull. He has been abroad for three years.

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WILLIAM J. HAGENAH, vice-president and special counsel Byllesby Engineering & Management Corporation, has been elected a director of the following companies: Northern States Power Company (Delaware), Northern States Power Company (Minnesota), Northern States Power Company (Wisconsin), Louisville Gas & Electric Company (Delaware), Louisville Gas & Electric Company (Kentucky), and Louisville Hydro-Electric Company (Delaware).

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GEORGE H. JENKINS, who has been connected with the Western Massachusetts Companies since 1927, has been appointed manager of the Agawam Electric Company and the Ludlow Electric Light Company, Springfield, to succeed Robert W. Mitchell, who recently took up new duties as general manager of the United Electric Light Company. After graduation from the Worcester Polytechnic Institute in 1909, his first connection was with the Westinghouse Electric & Manufacturing Company's testing course. Later he joined the D. C. & William B. Jackson Company, consulting engineers of Boston, on inventory work of the electric utility companies. He was for six years connected with the Greenfield Electric Light & Power Company. Following the war he engaged in some personal business enterprises, but in 1927 he again entered the public utility field with the Western Massachusetts Companies, assisting Mr. Mitchell in the managership of the Agawam Electric and Ludlow Electric companies.

Financial and Statistical News

LARGE scale merger and consolidation activities in the utility field have been singularly lacking for some months, presumably as a result of market uncertainty. Several capital and ownership adjustments, however, are said to be merely awaiting more satisfactory conditions.

——THREATENED ACTION OF THE NEW YORK STOCK EXCHANGE against "sharpshooting" seems to be welcomed in financial circles, but the same ruling, it is felt, should provide at times against indiscreet promotion on the up side.

——UTILITIES COMMON STOCKS ARE STILL SLIGHTLY ABOVE 1929 lows, although most other groups have dipped below that mark.

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Tenney Companies Mark Thirty Years' Service

THIRTY years of public service by utilities affiliated with Charles H. Tenney & Company, Boston, were commemorated on Wednesday of last week in a conference of about 200 executives and staff representatives at the New Ocean House, Swampscott, Mass. Confidence in the stability and growth of the light and power industry was voiced by the speakers, and the industrial health of New England was certified in various addresses.

Since 1900 the assets of the Tenney properties have increased from $423,000 to $86,908,000 and the group now serves the public in five states. Ellis L. Manning of the General Electric Company's research laboratories forecast the replacement of much rotating machinery by Coolidge electronic tubes, the advent of high-voltage direct-current transmission and striking improvements in electrical control. Remarkable advances in the X-ray study of metal are also on the threshold of practical application, he averred. Other guess speakers were J. Franklin Babb of the New England Council; F. R. Phillips, senior vice-president Philadelphia Gas Company, and Dr. Samuel W. Grafflin, New York City.

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Utility Companies Call Securities for Payment

CONNECTICUT LIGHT & POWER COMPANY has called for redemption November 1 at 110 and interest certain outstanding first and refunding mortgage 7 per cent sinking fund gold bonds, series A, amounting to $111,000.

All of the outstanding 7 per cent and 6 per cent preferred stocks of the Knoxville Power & Light Company have been called for redemption as of November 1 at 110 and dividends.

All of the outstanding refunding and external mortgage 5 per cent 35-year gold bonds of the Knoxville Railway & Light Company have been called for payment December 1 at 105 and interest.

Laurentide Power Company, Ltd., has called for redemption on January 1, all of the outstanding first mortgage 5 per cent sinking fund gold bonds at 105 and interest and all of its outstanding general mortgage 5½ per cent sinking fund gold bonds at 101 and interest.

State Line Generating Company has called for redemption November 1 at par and interest all of the outstanding 5½ per cent gold notes, due December 1, 1930, amounting to $14,000,000 and the 5½ per cent gold notes, amounting to $7,000,000, due May 1, 1931.

City Bank Farmers Trust Company, as successor trustee, has issued a notice to holders of Portland Railway, Light & Power Company first lien and refunding mortgage gold bonds, series B, and Portland Electric Power Company first lien and refunding mortgage gold bonds, series C, that the Pacific Northwest Public Service Company, as these companies are now known, has elected to redeem and pay all of these bonds on November 1, 1930 at 105.

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Federal Trade Commission Accountants Detail Carolina Findings

THE present Carolina Power & Light Company was created April 6, 1926, by a merger of the Pigeon River Power Company and the old Carolina Power & Light Company with three subsidiaries. A year previous to this all of the common stock of the old Carolina Power & Light Company had been acquired by the United Investors Securities Company upon an exchange basis. In 1925 the new National Power & Light Company, created by a merger of the old National Power & Light Company with the United Investors Securities Company, acquired the old Carolina Power & Light Company. The National Power & Light Company by exchanging the old Carolina Power & Light Company for the Pigeon River Power Company stock, which in turn was transferred to the new Carolina Power & Light Company, became a holding company, while the new Carolina Power & Light Company became an operating company. The Pigeon River and the old Carolina Power & Light holding companies disappeared by this adjustment.

From 1926 to 1928 inclusive the present Carolina Power & Light Company had increased its facilities to the extent of more than $20,000,000, and the total book value thereof on December 31, 1928, was approximately $85,000,000, the accountants found. The total includes $19,000,000 of intangible worth not segregated but distributed among various assets, besides $3,000,000 of discounts, premiums, commissions and expenses incurred in connection with the issue and redemption of stocks and bonds of the present Carolina Power & Light Company and its predecessor companies, which in 1926 amounted to 58 per cent of the Carolina Power & Light fixed capital assets.

The present Carolina Power & Light Company, aside from serving a population of 400,000 in North and South Carolina, is engaged in interstate transmission of electrical energy with eight connections on the state line. One of these, joining the Appalachian Electric Power Company of Virginia, helps to form two superpower systems which compose a system extending from the Great Lakes to the Gulf of Mexico.

The Electric Bond & Share Company is affiliated with the Carolina Power & Light Company through 15 to 30 per cent stock ownership of the National Power & Light Company, the accountants said. The Electric Bond & Share

Company took an active part in the mergers of 1925 and 1926. Of the $34,000,000 construction work by the Carolina Power & Light Company from 1926 to July 1, 1930, 44.4 per cent was by the Phoenix Utility Company, an ally of the Electric Bond & Share Company.

The retirement reserve of the Carolina Power & Light Company, based on a rate slightly more than 1 per cent, was considered inadequate because the provision made for it amounted to less than one-half the amount of depreciation and obsolescence the company claimed for tax purposes. Thus, thought the accountants, the company's net worth was overestimated to a considerable extent, as well as income available for dividends—both vital factors in determining the desirability of its securities from the investor's standpoint.

The figures obtained by the commission examiner were taken from the books of the Carolina Power & Light Company and its predecessors. No appraisal since 1907 has been made to determine if there has been any appreciation in the physical properties, nor has "going-concern" value been taken into account.

Minnesota Power probed by commission

Wednesday and Thursday of last week were devoted by the Federal Trade Commission, in its investigation of electric light and power company financing, to the testimony of Samuel Meisels, one of the commission's accountants, concerning the Minnesota Power & Light Company of Duluth, a subsidiary of the American Power & Light Company and affiliated with the Electric Bond & Share Company.

As reported last week, Mr. Meisels figured a capital write-up of more than $30,000,000. Of this aggregate, Mr. Meisels said that $20,032,000 is shown on the books of the Minnesota Power & Light—which was organized in 1923—as an inflation of the capital assets of the predecessor companies. Included in this write-up, he said, was more than $17,000,000 profit taken by the holding company.

In acquiring certain other properties which went into the Minnesota Power & Light there was a write-up of more than $2,000,000, the witness said. Another item in the inflation was an $8,750,000 write-up on the books of the Great Northern Power Company on its capital assets, which were turned over to American Power & Light, but before its transfer to the Minnesota company, said Mr. Meisels, this inflation was reduced to $5,373,735. To reach the aggregate figure of $30,293,346 the commission accountant included $2,848,000 of items charged to fixed capital account.

Against the write-up of $20,032,000, said Mr. Meisels, $19,500,000 of common stock was issued to American Power & Light and credited as paid for. On security issues by the Minnesota Power & Light of $37,000,000, he testified, the Electric Bond & Share received $268,000 in commissions.

Mr. Meisels said that access to the books of the Minnesota Power & Light's predecessor companies had been refused to him and thought there might be other write-ups that an examination of these books would disclose.

Out of every dollar of gross revenue collected over the five-year period by the Minnesota Power & Light, the witness testified, 24.3 cents has gone to dividends, 17.7 cents to preferred stock and 7.6 cents to common. Supervision fees paid Electric Bond & Share during the five years came to $522,243, declared Mr. Meisels, exclusive of construction fees to the Phoenix Utility Company.

Counsel for the company held that much of the examiner's testimony concerned controversial questions of accounting on which the company was not prepared to join issue at that time. Commissioner McCulloch extended to the company the privilege of answering the testimony when it was ready to do so, and the hearing adjourned subject to the commission's call.

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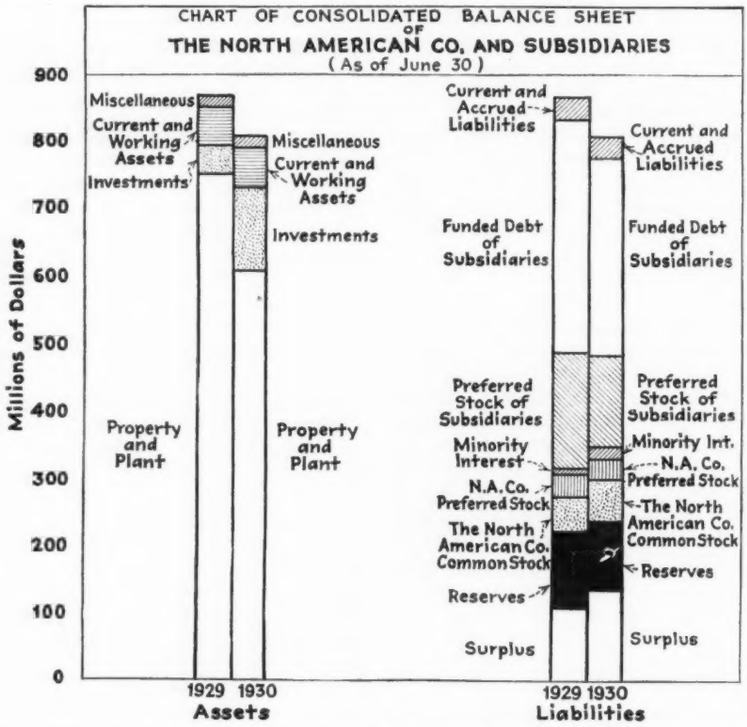
North American Company Shows Stronger Position

PROPERTY and capital adjustments arising out of the frequent shifts in control in the power and light industry are often bewildering to the public. Sometimes no effort is made to elucidate them.

In contrast with such a policy is that followed in the recently published balance sheet of the North American Company, which fully explains the balance sheet changes involved in the transfer of Pacific Coast properties of the company to Pacific Gas & Electric Company. In return North American Company received 1,825,000 shares of Pacific Gas & Electric common, giving North American Company a 32 per cent interest. This transfer of stock appears in the sharp rise in investment account. As of June 30, 1930, North American Company's investments in securities of other companies, along with sundry investments, totaled $123,767,655, which is an increase of some $60,000,000 from the total as of March 31. The Pacific Gas & Electric stock is the largest factor in this addition, although subscriptions to rights of North American Light & Power Company and Detroit Edison contribute.



It is significant of the North American Company's conservative policy that in entering the Pacific Gas & Electric stock in the consolidated balance sheet only the valuation at which the interests in the California properties were carried is allowed. This amounts to only slightly more than the book value of the stock on Pacific Gas & Electric Company's books and is far below the current market value of around $52, and a high for the year of $75. On the total number of shares the valuation used is slightly over $59,000,000, against current market value of over $100,000,000.

Offsetting the decrease in plant and property due to the transfer, there is in addition to the increase of $59,000,000 in the investment account a reduction of almost $100,000,000 since March 31 in the funded debt of subsidiaries and of about $35,000,000 in subsidiary preferred stocks, as indicated in the accompanying graph. As stated in the president's quarterly letter to shareholders:

"The increases actually occurring in the items of assets and liabilities during the twelve months ended June 30, 1930, accordingly are not reflected in the accompanying consolidated balance sheet as of that date because of the entire elimination of the assets and liabilities of the California subsidiaries, including their preferred stocks and funded debt obligations. Such Pacific Gas & Electric Company common stock is included in investments in the consolidated balance sheet of June 30, 1930, and represents a substantial part of the increase in this item. No adjustment has been made to reflect the large excess of market value of such stock over the value at which the interests in the California subsidiaries were carried prior to transfer."

Earnings of North American Company for the period ended June 30 have already been reported in these columns. The annual dividend of $2 per share on Pacific Gas & Electric stock will contribute an additional $3,650,000 per year to North American earnings, approximately equal to the earnings of the California properties acquired by Pacific Gas & Electric from the North American Company.

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NEWS BRIEFS

Directors of the Hartford Electric Light Company have declared an extra dividend of 9¼ cents per share in addition to the regular quarterly dividend of 68¾ cents per share, both payable November 1 to holders of record October 15.

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Hamburg Electric Company (Hamburgische Electricitätswerke) will retire on November 1 outstanding ten-year sinking fund 7 per cent external gold debentures, to the amount of $100,000. These debentures, due November 1, 1935, will be redeemed at par and interest.

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The New York Stock Exchange has authorized the listing of an additional $3,000,000 of first mortgage thirty-year 4½ per cent gold bonds, series B, of the Kansas City Power & Light Company due January 1, 1957, making the total amount applied for $6,000,000.

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Canadian Output Off

AUGUST output of central electric stations in Canada this year decreased 2.9 per cent, compared with last year, to 1,402,772,000 kw.-hr. This is 0.8 per cent less than the output for July, whereas an increase is normal at this season. Of the total, 1,382,166,000 kw.-hr. were generated from water power. This is the first month in 1930 in which the total output has fallen below the output of the corresponding month of last year.

The sharpest loss came in Ontario, 11 per cent; Quebec fell off 0.5 per cent from the output of August, 1929; British Columbia gained 3 per cent. The most remarkable change occurred in the hydro output of the Maritime Provinces, which has been consistently running far ahead of last year and is now more than twice as great. The starting of new pulp and paper mills is said to be the cause of this increase.

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August Output Low

ELECTRICAL ENERGY PRODUCTION by public utility power plants in August was 0.1 per cent more than in July, but was less by about 5½ per cent than in August, 1929, according to the United States Geological Survey. This leaves a gain of about 5 per cent compared with August, 1928.

Only two of the nine geographical regions showed a gain for the year, the North and South West Central States each moving up 2 per cent.

Hydro-electric energy fell off to a marked degree because of the drought. The output was 12 per cent less than in 1929, itself a dry year, and 18 per cent less than in 1928. Of the total output for August, 7,878,802,000 kw.-hr., water power produced 2,493,084,000 kw.-hr., or 32 per cent.

Regional changes in total output compared with 1929 and in hydro-electric output for recent months are shown in the accompanying table.

Region	(Per Cent) Total, Compared With 1929		Hydro Electric	
	July	August	June-July	July-August
New England	— 6	— 8	—20	—16
Middle Atlantic	0	— 3	—13	—10
East North Central	— 9	—10	—24	—24
West North Central	+ 8	+ 2	—13	—22
South Atlantic	—11	—13	—23	—32
East South Central	+ 6	— 7	+ 1	—10
West South Central	+ 7	+ 2	...	...
Mountain	— 6	— 7	+ 3	— 6
Pacific	+ 2	— 2	+11	— 6

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NEW CAPITAL ISSUES

During the first week of October the Super-Power Company of Illinois made an offering of first mortgage 4½ per cent gold bonds priced at 96 and interest, yielding about 4.72 per cent, a piece of financing involving a total of $10,000,000. These bonds will be secured by a first mortgage on all of the fixed properties, rights and franchises of the company, now owned, and on all such properties hereafter acquired against which any bonds may be issued under the mortgage.

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Among the new offerings two Canadian issues appeared. The Shawinigan Water & Power Company issued first mortgage and collateral trust sinking fund gold bonds, series D, to the amount of $20,000,000, the price being 97½ and accrued interest, yielding 4.63 per cent. These securities, dated October 1, 1930, will mature October 1, 1970. Proceeds of this issue will be used to retire the $7,851,000 outstanding funded debt of the Laurentide Power Company, Ltd., and toward cost of additions and improvements to the company's properties during 1931, including transmission and distribution lines, and work on the new hydro-electric power development at Rapide Blanc on the upper St. Maurice River.

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First mortgage 30-year sinking fund gold bonds of the Nova Scotia Light & Power Company, Limited, have been offered at 96 and accrued interest, to yield over 5.25 per cent, a piece of financing involving a total of $845,500.

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New Jersey Power & Light Company made an offering of first mortgage gold bonds to the amount of $2,000,000, the price being 101.50 and interest, yielding over 4.40 per cent. All 5 per cent bonds now outstanding in excess of $4,000,000 will be called for payment and canceled on or before March 1, 1931. The company owns and operates properties supplying electric light and power in 279 communities in northwestern New Jersey, extending into the metropolitan district surrounding New York City, with an estimated population of 175,000.

Business News and Markets

Equipment Companies Form Consolidation

UTILITIES EQUIPMENT CORPORATION, LTD., and Jones-Lyman & Company, Inc., have consolidated and will operate under the name Utilities Equipment Corporation, Ltd., exclusively. Utilities Equipment Corporation, Ltd., is direct factory representative for the following companies:

American Brown Boveri, Inc., Condit Electrical Manufacturing Company, Railway & Industrial Engineering Company, American Loom Company, National Electric Products Corporation (American Copper Products Division), National Electric Products Corporation (British American Tube Division), Cleveland Brass Manufacturing Company and Coffing Hoist Company.

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National Electric Power Appliance Sales Up

NATIONAL ELECTRIC POWER COMPANY, a part of the Middle West Utilities System, reports a gain of 18.8 per cent in August appliance sales by subsidiaries in fifteen Eastern states. For the first eight months of 1930 appliance sales totaled $4,328,500, an increase of 13.9 per cent over sales at August 31, 1929, when the total was $3,799,700.

Notable gains were reported in the sale of large load-building appliances. Sales at August 31 included 3,271 electric ranges, a gain of 34.6 per cent; 5,545 electric refrigerators, a gain of 26.9 per cent, and 660 electric water heaters, nearly three times the sales for the same period in 1929.

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Germany's Electrical Exports Higher

IMPORTS OF ELECTRICAL MACHINERY and apparatus into Germany during the seven months ending with July last attained a value of only $6,055,750, as compared with $7,338,250 in the corresponding period from 1929, according to official returns. On the other hand, the exports of similar material from Germany reached a total of no less than $80,996,500 as contrasted with $79,088,000. The import total was made up of $1,475,000 of electric machinery and parts, apparatus and fittings to the extent of $4,580,750. The respective figures for the exports were $16,440,250 and $64,556,250.

Baron Parrilli Sees Europe on Mend

PRESS dispatches predicting possible serious consequences of national enmities, and strife for economic supremacy in Europe are greatly overdrawn, Baron Luigi Parrilli, European manager Kelvinator Corporation, told ELECTRICAL WORLD on his arrival from Europe. The Baron is decidedly optimistic on the business outlook there for the immediate future. He pictures a steadily expanding market for American electrical and other goods.

One factor in market expansion emphasized by Baron Parrilli is the rapid growth in installment selling in many European countries. Time selling has taken hold and is doing much to enlarge the markets, especially for household products, machinery, etc.

It is this market expansion, in fact, which calls for development in Europe more than any other phase of business, Baron Parrilli points out. Adoption of American labor-saving devices and mass-production methods have increased output greatly, while markets have remained relatively static. In fact, they have even been contracted by the displacement of labor through the introduction of these labor-saving devices. This problem must be faced and solved.

Baron Parrilli states that American capital is needed and is welcome, both in Italy and in several other countries of Europe, especially where minority interest rather than control is involved.

Middle West Utilities Merchandise Sales Gain

MERCHANDISE SALES of Middle West Utilities system for the first six months of 1930 were approximately 26 per cent ahead of last year. Martin J. Insull, president, said:

"It is especially significant to note the steady increase in the heavier consuming appliances which have a marked effect in increasing the output and improving operating efficiency."

Sales of electric refrigerators are 14 per cent ahead of last year and sales of electric ranges have shown approximately the same gain. The sale of electric water heaters in the first half of 1930 was more than three times as great as that in the first half of 1929. Indications are that approximately $2,000,000 annual service revenue will result from this year's merchandising activities.

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Copper Sales Feature Metal Market

ANOTHER EXCELLENT WEEK'S BUSINESS can be recorded in copper, domestic sales for the week ended October 8 amounting to about 38,000 tons. A considerable unsatisfied demand continues for first-quarter shipment at current prices, but most producers will not consider such business. Approximately 6,000 tons have been booked in the last week for 1931 shipment.

	Oct. 1, 1930 Cents per Pound	Oct. 8, 1930 Cents per Pound
Copper, electrolytic	10	10
Lead, Am. S. & R. price	5.35	5.20
Antimony	7½	7¼
Nickel, ingot	35	35
Zinc, spots	4.60	4.55
Tin, straits	28	26.80
Aluminum, 99 per cent.	23.30	23.30

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Equipment Buying Active

Wisconsin Power & Light Company has placed with the Westinghouse Electric & Manufacturing Company an order for a set of switching equipment for the control of a generating station.

An aging oven and a roller hearth furnace has been purchased by the Aluminum Company of America from the Westinghouse Electric & Manu-

facturing Company for installation at its Alcoa, Tenn., plant.

Northern States Power Company has ordered three Westinghouse fourteen-retort link-grate stokers for installation in its Riverside plant at Minneapolis, Minn.

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TRADE BRIEFS

General Electric Company has plans for a new manufacturing building to cost $1,000,000 to be erected at the Pittsfield plant, announced E. A. Wagner, general manager of the works.

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The progress of Electrad, Inc., has necessitated the enlargement of its export department, according to a statement by Arthur Moss, president of the company. Xavier de Nice, widely known expert in export matters, has been appointed export manager.

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Curtin-Howe Corporation of New York has licensed two new plants to use the ZMA process—the Maryland Wood Preserving Company, a Shipley plant at Hagerstown, Maryland, and the T. J. Moss Tie Company's plant at Columbus, Miss.

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Packard Electric Company, manufacturer of cable and wiring harnesses for automotive and aviation industry, reports a net profit of $81,333 after charges and federal taxes, equivalent to 60 cents a share on 134,370 no-par shares of capital stock, for six months ended June 30, 1930. This compares with $293,041, or $2.18 a share, in first half of 1929.

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American Engineering Company, Philadelphia, has appointed as distributing agents for its "Lo-Hed" electric hoists Starr-Carpenter in the Pittsburgh district and Weed & Company in the Buffalo district.

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Welding Engineering & Research Corporation, 25 West 43d Street, New York, has recently been organized by James W. Owens, formerly director of welding at the Newport News Shipbuilding & Drydock Company, Newport News, Va., and Prof. C. A. Adams, C. A. McCune, J. H. Deppeler, Leon S. Moisseiff, and A. V. deForest.

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Pacific Gas & Electric Company has placed what is stated to be the largest order for hollow-core copper cable in the history of the Western states with the Anaconda Wire & Cable Company. The contract calls for 166 miles of 1-in. cable, for delivery before February.

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Inca Manufacturing Division of National Electric Products Corporation, with main factory and general offices at Fort Wayne, Ind., has purchased the plant and equipment of the S. & L. Manufacturing Company, Los Angeles.

•

Foxboro Company announces the appointment of C. C. Fuller to the position of manager New York office.

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Hoosier Engineering Company of Chicago, erector of transmission lines, has recently opened a Western branch office at Seattle, under H. R. Stephens.

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Technological Unemployment an Industry Problem

UNEMPLOYMENT of any sort stands out by all odds as the most tragic problem in our present economic order. And certainly that type which is due to mechanization improvements is especially poignant because, for one thing, so many of the workers who are displaced by new equipment are the older skilled craftsmen above the "40-year dead line." Their livelihood has for decades come from their own trained dexterity. It is for that reason all the more difficult for them to find new jobs. Even the operation of the new machines calls for the faster fingers and quicker eye of youth.

The increase in the volume of output of manufactures in this country since 1921 has been just about 80 per cent. In the same time the number of wage earners in factories increased by only 22 per cent—certainly an indication of the greatly increased efficiency of mechanical equipment, management and skill of the workers.

Unless new and much more effective methods of distribution are devised and great headway made in developing new markets, it is difficult to foresee how the industry can escape a steadily intensifying severity of its already acute problems.

According to William L. Green, president of the American Federation of Labor, the normal increase in our population since the war has brought forward more than 5,500,000 more persons who want work as wage earners, while jobs in manufacturing have decreased by nearly 600,000. He calculates, therefore, that we need more than 6,000,000 new jobs.

Of course, the situation is not confined to this country. Europe has had, if anything, an even more severe disruption as the result of the sudden widespread introduction of new production methods. There has been a widespread introduction of American machinery mass production, standardization, simplification, etc. Perhaps the best evidence of this movement has been the volume of our exports of machinery to Europe, which have totaled in excess of $1,000,000,000 since the war.

The reports of scores of European leaders and delegations visiting our factories since the war, though impressed with technological achievements, have consistently failed to stress the other half of the picture, namely, the strengthening of consumer demand. The attainment and maintenance of this all-important balance between supply and demand is certainly the outstanding problem confronting European industry today, and there can be no doubt that technological unemployment contributes a substantial portion of her 7,000,000 unemployed.

Putting this concretely, there is a growing conviction that industry, labor and the government are under a joint moral obligation, if not, indeed, an economic one, to train the displaced workers for other jobs, to soften the blow to the worker and thus to the consuming body of the nation. It would be foolhardy indeed for labor or any other element in our industrial or economic system to stand in the way of technological progress.

Consumers can doubtless do much to alleviate the technological unemployment evils by a little more sensible collaboration, but co-operation among producers would seem to offer prospects of quicker progress in solving the problem. Unless industry takes the initiative in training and placing the displaced, it is feared that politics may try to do it for us. At the last session of the Senate there was a tentative proposal of a 1 per cent tax on industrial production to accumulate a revolving fund expressly for the purpose of alleviating this type of unemployment.

Market Conditions

ELECTRICAL equipment sales are probably at the lowest level for any single week to date. There is little tangible promise of immediate improvement. The Southwest and New England report fair movement of motors and small equipment.

——PACIFIC COAST POWER PLANT BUSINESS for October will probably reach three-quarters of a million dollars, but there is little activity at the moment.

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EASTERN

—ELECTRICAL EQUIPMENT IS ENCOUNTERING *a listless attitude in the New York market both with regard to immediate business and prospective future commitments. Inquiries are showing a tendency to ease off as compared with the opening weeks of autumn and the general outlook is growing indefinite. Central stations are purchasing only for actual needs and there is little future buying in that quarter.*

—INDUSTRIAL ACCOUNT LOOKS A *little brighter for orders during the next 30 to 60 days, particularly in connection with steel mill, metal-working and ice plant expansion. Electrical supply business continues quiet and there is no prospect of any immediate change.*

A metropolitan central station has placed an order with a New York manufacturer for switchgear totaling about $40,000. A Pennsylvania power company has secured quotations for six generating units, each of 42,500 hp. rating, for a hydro-electric power installation, and orders will be placed for these as well as considerable accessory equipment; ultimately, the plant will have six more such turbines of like capacity. The Combustion Engineering Corporation will furnish boilers, furnaces and pulverized fuel-burning equipment for a power development at Boncar, W. Va., the order totaling about $500,000.

Industrial demand looks brighter with the early expansion programs of a number of large companies. The Pittsburgh Plate Glass Company is projecting a sheet glass plant in Michigan to cost over $15,000,000. The American Can Company has authorized a plant at Honolulu, T. H., to cost $1,500,000. The Pennsylvania Railroad Company, Philadelphia, Pa., has plans for an abattoir to cost approximately $5,000,000. A New York newspaper has placed an order for motors and other equipment for a new printing plant with a state manufacturer, totaling about $35,000. The Westinghouse Electric & Manufacturing Company has taken an award for electric furnaces and allied equipment for a new smelting plant in Tennessee.

A manufacturer of transformers says that business shows quite a little improvement and inquiries are being recorded in a larger volume than for several weeks past. This company's plant is running at about 75 per cent of normal. A manufacturer of electric refrigerators reports business at a high level and will carry out an expansion program for larger output to cost upward of $100,000. A maker of radio tubes in New England has adopted a capacity schedule on a basis of 20,000 tube units daily, giving employment to an increased working force. A number of municipalities in the Middle West are entering the market for equipment for city-owned power stations and some sizable business is looked for from this account.

CONSTRUCTION PROJECTS

Signal Supply Officer, Army Base, Brooklyn, N. Y., will receive bids until October 30 for fourteen d.c. motors (Circular 35); also, until October 28, for fifteen wind-driven generators (Circular 34). R-K-O-Radio Pictures Corporation, New York, plans a film laboratory at Hollywood, Calif., to cost about $1,000,000. Municipal Sanitation Commission, New York, plans sewage disposal plant on Ward's Island to cost $17,800,000. International Nickel Company, New York, has approved plans for an addition to mill at Copper Cliff, Ont., to cost about $500,000. Trenton, N. J., plans an ornamental lighting system on a number of streets. Pennzoil Company, Oil City, Pa., will carry out an expansion program at oil plant to cost $500,000. West Penn Power Company, Pittsburgh, Pa., will proceed with a power substation at Donora, Pa. Pennsylvania Railroad Company, Erie, Pa., has plans for a grain elevator to cost $400,000. Grove City College, Grove City, Pa., plans new science unit at institution to cost $500,000. Gulf Refining Company, Pittsburgh, Pa., has authorized an oil storage and distributing plant at Cincinnati, Ohio, to cost $1,000,000. The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until October 21 for one switchboard panel and one 75-hp. oil engine for the San Francisco navy yard (Schedule 4157), and until October 28 for turbine-driven air compressors and spare parts for Eastern and Western yards (Schedule 4161.)

NEW ENGLAND

—WHILE ORDERS FOR HEAVY *electrical machinery continue quiet, sales of small motors and power equipment are encouraging. During the past week small motor sales gained. Fractional-horsepower motor sales gained and switch and control apparatus were steady.*

General scheduled materials are spotty. Orders for wire and contractors' materials increased, with materials for outside electric illumination in fair demand. Sporadic interest is shown in industrial heating. Central-station supplies in this district are receiving scant attention and sales are lagging. Inquiries, on the other hand, are gaining and attention appears to be pointing toward renewal of sales activity. Special electrical equipment is receiving some attention. Traffic control installations recently reported show gains in the adoption over last year. Merchandising has slowed up somewhat. Radio interest is active.

CONSTRUCTION PROJECTS

General Electric Company, Pittsfield, Mass., plans addition to local transformer manufacturing plant to cost $1,000,000. Wilmington Packing Company, Wilmington, Mass., plans poultry feed mill to cost $100,000. American Brass Company, Waterbury, Conn., plans brass tube mill at Toronto, Ont., to cost over $200,000.

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SOUTHEAST

—BUSINESS PROSPECTS IN THE *Southeast continue to look slightly better and there is some improvement to be noted in the general run of business; however, few individual orders of any moment are being placed.*

The city of New Orleans placed an order last week for panelboards, switchboards and motor-generator sets amounting to approximately $90,000, while the power company in that town ordered $10,000 worth of street-lighting equipment and voltage regulators. A Georgia company ordered voltage regulators totaling $6,500 and disconnect switches amounting to $5,100. Some other central-station orders were for $1,450 in creosoted pine poles and $2,175 in car wheels. There is in immediate prospect an order for 150,000 lb. of bare and weatherproof copper from North Carolina and a $5,000 junction box order from the Georgia territory. A contract was let this week covering the wiring of an addition to and the revamping of the old plant of a Georgia textile mill, the wiring materials to cost approximately $30,000. Motor equipment for the addition was ordered a few weeks

ago. Within the next six weeks a North Georgia cotton mill will let contracts covering changes in and additions to plant involving $15,000 in electrical materials and equipment.

CONSTRUCTION PROJECTS

Bald Knob Furniture Company, Rocky Mount, Va., will carry out expansion and improvement program to cost $400,000. Memphis, Tenn., plans electrically operated pumping plant to cost over $1,000,000, with machinery. Kinston, N. C., will receive bids until October 14 for power plant. Yazoo Portland Cement Company, Nashville, Tenn., contemplates cement mill at Vicksburg, Miss., to cost over $700,000.

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MIDDLE WEST

—BUSINESS IN THE *Middle West section appears to be marking time. The month of September, while generally satisfactory in most respects, was somewhat disappointing in its general aspect. The volume of business did not increase as rapidly or to as large an extent as anticipated, although it now seems that the improvement made during September is being held.*

Retail trade has picked up and a general increase, although slight, in consumer purchasing is noticeable. While some placing of future commitments is going on, the tendency still seems to be for hand-to-mouth buying. The various utility companies are very active in certain phases of work, while other work is at a complete standstill. The general feeling for the most part still continues optimistic and with the curtailment of production, reduction of inventories and decrease in carloadings that has been going on up to this time this month must surely see a resumption of normal fall business.

CONSTRUCTION PROJECTS

Wauwatosa, Wis., is asking bids until October 17 for an ornamental lighting system. Western Electric Company, Hawthorne, Ill., has plans for new plant unit to cost over $500,000. Pittsburgh, Youngstown & Ashtabula Railway Company, Youngstown, Ohio, will make extensions and improvements in freight terminal and yards to cost $1,000,000. Republic Steel Corporation, Warren, Ohio, will make extensions and improvements to cost $300,000. Otter Tail Power Company, Fergus Falls, Minn., plans transmission line from Arndt to Rock Lake, N. D. Central West Public Service Company, Omaha, Neb., plans transmission line at Woonsocket, S. D., and vicinity. Litchfield, Minn., contemplates ornamental lighting system. Iowa-Nebraska Light & Power Company, Lincoln, Neb., plans equipment storage and distributing plant to cost $40,000. John Deere Plow Company, Moline, Ill., plans factory branch and distributing plant at Sioux City, Iowa, to cost $100,000. Grundy Center, Iowa, plans bond issue of $80,000, for municipal electric light and power plant.

PACIFIC COAST

—MACHINERY AND POWER APPARATUS *manufacturers report a very poor week, though close to three-quarters of a million dollars worth of power plant business is to be placed this month.*

—RETAIL TRADE *is very quiet, with considerable interest in the new combination and recording radio, but few actual orders. The outdoor Christmas tree lighting campaign which achieved so much success on the Pacific Coast last year has been formally launched and is expected to double last year's showing, with the help of miniature golf courses.*

A power company report, just published, shows about 350 miniture golf courses in Los Angeles and 130 in San Francisco with an average load of 10 kw. at an annual revenue of $500. Prospective building is excellent, including a $3,500,000 hotel for Portland, a $600,000 apartment house for Los Angeles, $500,000 school jobs for Oakland and Los Angeles, and a $500,000 court house annex for Fresno, a $700,000 insurance building for San Francisco and the $750,000 engineering building for the University of California. Street-lighting work includes installations for Santa Barbara, San Leandro, Petaluma and a $4,000 award for Red Bluff. The outstanding supply order for a very poor week covered 160,000 ft. of 4-in. fiber conduit for the city of Los Angeles, costing about $20,000.

Sales volume of motors and control apparatus, distribution and small station transformers and wire was reported to be fair, although there were no individual sales of consequence announced. A slight improvement was noted in sales for maintenance and minor additions and inquiries for budget-making purposes were said to be quite heavy. Movement reported included about $5,000 worth of miscellaneous switchgear to Puget Sound central stations, eighteen motors from 25 hp. down to dealers, ten machines from 50 hp. down to miscellaneous industrials and about 30 from 100 hp. down to mills, allied industrials and agricultural sources. City of Spokane is taking bids until October 16 for one 200-hp., 1,800-r.p.m. motor without starting apparatus and preliminary plans are being prepared for a projected 500-kw. privately owned hydro-electric project, involving 10 miles of transmission line in eastern Oregon. Specifications are expected shortly for equipment for an initial 10,000-hp. unit of a projected 20,000-hp. hydro-electric development at Hyder, Alaska, for the Portland Canal Power Company.

Plans for rehabilitating the pumping unit of the Kennewick irrigation project in eastern Washington by the federal government are being prepared and the Northwestern Electric Company has awarded a contract for a substation in Portland, which completed and equipped will cost $50,000. Expenditure of $5,000,000 over and above the $8,000,000 scheduled to be spent is planned by Powell River Pulp & Paper Company, Vancouver, B. C., in an additional hydro-electric development and enlargement of existing pulp and paper mills. The Buckley Logging Company, Buckley, Wash., will build a lumber and planing mill at once.

CONSTRUCTION PROJECTS

Pacific Gas & Electric Company, San Francisco, Calif., has plans for equipment storage, distributing and service buildings at Auburn and Redwood City, Calif., to cost $100,000. Southern Sierras Power Company, Riverside, Calif., plans transmission line in San Bernardino County reported to cost $75,000. Santa Barbara, Calif., will receive bids until October 27 for ornamental lighting system. San Jose, Santa Ana, Red Bluff, Woodland and Glendale, Calif., plan ornamental lighting systems. Furniture Corporation of America, Inc., Portland, Ore., contemplates plant at Emeryville, Calif., reported to cost $200,000. Salem, Ore., is arranging a bond issue of $5,000,000 for a municipal electric light and power plant. Cascade Utilities Company, Oakridge, Ore., plans hydro-electric power plant to cost over $200,000. Bureau of Reclamation, Denver, Colo., will receive bids until October 31 for one 800-hp. motor and pumping unit for pumping station No. 1, Minidoka Project, Idaho (Specification 514).

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SOUTHWEST

—THERE HAS BEEN CONSIDERABLE *buying of meters and distribution transformers by central stations during the past week and a fair demand for medium sizes of apparatus by manufacturing concerns.*

There are some good-sized jobs being figured, but only two contracts worthy of mention have been reported. One is for a lot of regulating equipment amounting to $6,500 for an Illinois public service company and an outdoor substation with transformers, switching equipment and lightning arresters for a company in southeast Missouri to cost $4,250.

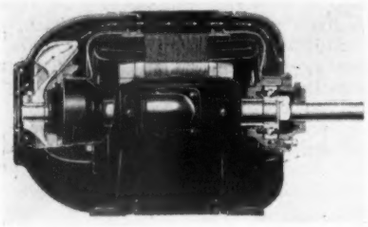
CONSTRUCTION PROJECTS

Arkansas Power & Light Company, Pine Bluff, Ark., plans transmission line from Pine Bluff to Carpenter, Okla. Texas Pacific Coal & Oil Company, Thurber, Tex., plans oil refining plant at Temple, Tex., to cost over $500,000. Texas Utilities Company, Plainview, Tex., will build steam-operated electric generating plant at Tuco, Tex., to cost over $600,000. Denton, Tex., has approved plans for municipal ice-manufacturing plant to cost $50,000. Baton Rouge Electric Company, Baton Rouge, La., plans equipment storage and distributing plant to cost $40,000.

New Equipment Available

Totally Inclosed Motors with Standard Mounting

DUST-TIGHT, TOTALLY INCLOSED, fan-cooled, induction motors equipped with ball bearings in convenient cartridge housings and utilizing a single ventilating fan located outside the inclosure proper are announced by the General Electric Company, Schenectady. These



motors have the same mounting dimensions, rating for rating, as the standard General Electric open type, horizontal, general purpose motors, from ¾ to 50 hp.

Any necessary disassembly or reassembly of the motor is facilitated by the simplified mechanical construction. The dust-tight, cartridge type ball bearing housings are a further aid in this respect. These permit removal of the rotor without exposing the bearings to dust or dirt. These motors are indorsed by the Underwriters' Laboratories for hazardous dust conditions.

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Shunt Tension Indicator Measures Pull on Cables

TENSION INDICATORS WHICH OPERATE on the deflection principle and will register the load on the line as well as indicate any change or variation in the load are announced by the Martin-Decker Corporation, Long Beach, Calif. These instruments may be used on lines having tensions as high as 260,000 lb. and operate without dead ending. The principle of operation is simple. A slight offset is made in the line between two fixed points. The pressure to make this offset is balanced by a fluid body behind a flexible diaphragm. This pressure is a direct measure of the load on the line.

Readings may be taken very rapidly with this instrument, one reading usually taking less than a minute, according to the manufacturer. It is particularly adapted to measuring the tension in electric transmission and distribution lines. For underground work it is of advantage in determining the pull on conductor and cable through conduit.

The standard indicator is made of high tensile aluminum alloy and weighs but 11½ lb. It will take lines from ¼ in. to ⅝ in. in diameter.

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STARTING SWITCHES DESIGNED especially for normal- and high-torque, low-starting current, line-start motors which are adaptable to all small motor installations are announced by the Arrow Electric Division of the Arrow-Hart & Hegeman Electric Company, Hartford, Conn. These line switches can be mounted in a small space, the initial cost is low, and their ease of wiring makes the installation cost the lowest for all motor-starting switches, according to the manufacturer. A special lever construction combines easy operation with positive "kick-off" release.

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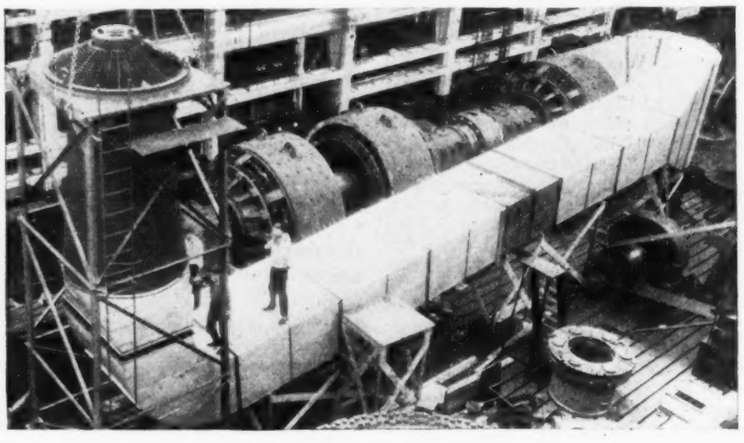
Twin 5,000-Hp. Motors for Blooming Mill Drive

DOUBLE-UNIT 5,000-HP. REVERSING MOTORS for twin drive on blooming mills are being manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The illustration shows a shop test set-up with one of the motors ready to run at full load. It operates at from 40 to 80 r.p.m.

To provide proper ventilation to care for the amount of heat generated by these motors under load, a vertical



propeller type fan, powered by a 75-hp. motor running at 1,450 r.p.m., is used. Air at the rate of 70,000 cu.ft. per minute rushes into the motor to keep it cool.

Non-Magnetic Cast Iron for Electrical Equipment

CORROSION AND HEAT-RESISTING alloyed cast iron which is non-magnetic and may be used in electrical equipment has been developed by the International Nickel Company. This new metal is said to have a high electrical resistivity of 85 to 95 micro ohms per cubic centimeter, low conductivity, low permeability and non-sparking quality. It is claimed that field tests have established an increased service life for this material as compared with plain iron, and a life comparable in many cases to that of bronze. In working the metal is handled much the same as gray iron.

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Earth-Drilling Machine for Mounting on Tractor

AN EARTH DRILL that can be mounted in the field on any standard Caterpillar "Twenty" tractor or on the wide type tractors has recently been placed on the market by the Buda Company, Harvey, Ill.

When installed, this drill is attached to the side of the tractor so that the operator has a clear view of the hole location. The winch is mounted on the opposite side and the pole-setting derrick is mounted to the rear. Both the winch and the earth drill are operated by the tractor engine, power being taken from a special power take-off located to the rear of the tractor. The earth drill is mounted in a special cradle and the side movement of the drill spindle is taken care of by swinging the drill in the cradle. This cradle and worm arrangement give very quick adjustment for drilling perpendicular holes when the tractor is on uneven ground. Holes may be drilled at any reasonable angle for anchors, etc.

The drill will cut holes up to a 24-in. diameter and a 10-ft. depth.